harman/kardon

Model FL8370

5 Disc Compact Disc Changer

SERVICE MANUAL



CONTENTS

harman/kardon, Inc.
250 Crossways Park Dr.
Woodbury, New York 11797

Rev0 11/2000

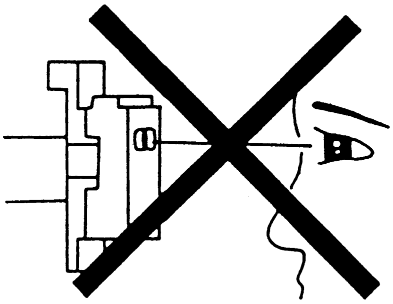
LASER BEAM SAFETY PRECAUTIONS

CLASS 1 LASER PRODUCT



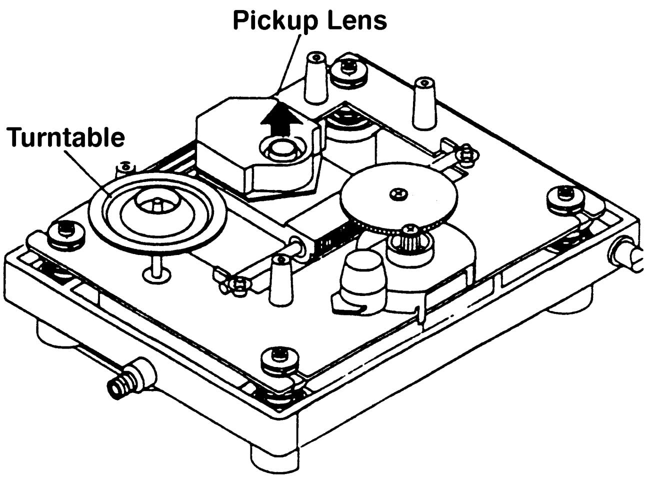
CAUTION
Invisible laser radiation when the unit is open.
Do not stare into beam.

CAUTION: USE OF ANY CONTROLS, ADJUSTMENT, OR PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.



Do not look directly at the laser beam coming from the pickup or allow it to strike against your skin.

This compact disc player uses a pickup that emits a laser beam. The laser beam is emitted from the location shown in the figure. When checking the laser diode, be sure to keep your eyes at least 1 foot away from the pickup lens when the diode is turned on. Do not look directly at the laser beam.



CAUTION:

Using controls and adjustment, or doing procedures other than those specified herein, may result in hazardous radiation exposure.

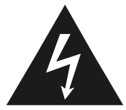
SAFETY PRECAUTIONS



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.



This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Caution: To prevent electric shock do not use this (polarized) plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

Attention: Pour prévenir les chocs électriques ne pas utiliser cetre fiche polarisée avec un prolongateur, une prise de courant ou une autre sortie de courant, sauf si les lames prévent être insérées à fond-sans en laisser aucune partie à découvert.

HANDLING LASER PICKUP

The laser diode in the optical system of this player can be damaged by electrostatic discharge from your clothes or your body. Proper electrostatic grounding for service personal is required during servicing.

BEFORE REPAIRING THE COMPACT DISC PLAYER

Preparation

Human Body Grounding:

Many of the components used in this compact disc player, including the laser pickup, are sensitive to electrostatic discharge. Service personal should be grounded with an electrostatic armband (1 Mohm).

Caution:

Static charge on clothing does not escape through a body grounding wrist band.

Be careful not to contact the pickup or electrical components with your clothing.

Workbench and Tool Grounding:

A properly-grounded electroconductive plate (1Mohm) or metal sheet should be fitted to the workbench surface. Tools and instruments (such as soldering irons and scopes) should be grounded to prevent AC leakage.



Fig. 1

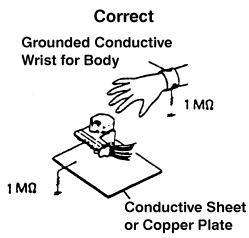


Fig. 2

Note: Laser diodes are so susceptible to damage from static electricity that, even if a static discharge does not ruin a diode, it can shorten its life or cause it to work improperly.

FL8370 Production Specification

GENERAL INFORMATION

1. Power Consumption	Operating <18W; Standby <5W
2. Power Super	230V AC 50Hz or 120V AC60Hz
3. Dimensions	440 x 130 x 386mm
4. Product Outlook	Refer to attached diagram
5. Remote Unit	RT03, harman/kardon remote code
6. Compliance Requirement	i EMC: EN55013, EN55020, EN61000, EN55022 ii. LVD: EN60065, IEC65 iii. CSA, C-UL iv. HDCD
7. Disc Changer Mechanism	5 disc carousel; Play 1 change 4
8. Sound Processor	HDCD
9. CD Servo System	Auto Alignment

AUDIO SPECIFICATION

	Typical	Limit
Output Level 1KHz 0dB (no HDCD)	2.0 Vrms	+-1dB
Output Level 1KHz 0dB (HDCD output)	4.0Vrms	+- 2dB
Frequency Response 20Hz~20KHz reference	+0-1dB	+0.5-1.5dB
THD 1KHz 0dB (30KHz Filter)	0.01%	0.05%
THD 1KHz 0dB (no any filter)	0.03%	0.08%
THD 20Hz~20KHz 0dB (30KHz Filter)	-	0.05%
S/N 1KHz 0dB A-weighted	98dB	93dB
Dynamic Range	95dB	90dB
Channel Separation 1KHz 0dB(30KHz Filter)	85dB	80dB
Channel Balance	+-0.5dB	+-1.5dB
De-emphasis (5KHz, 16KHz)	+-0.5dB	+-1.5dB

Headphone output specification under 32 ohm load

Maximum Headphone Output Level 1KHz 0dB	1.5Vp-p	+-0.2Vp-p
Frequency Response (20~20KHz)	+-1dB	+-1.2dB
THD 20~20KHz 0dB (30KHz Filter)	0.1%	0.2%

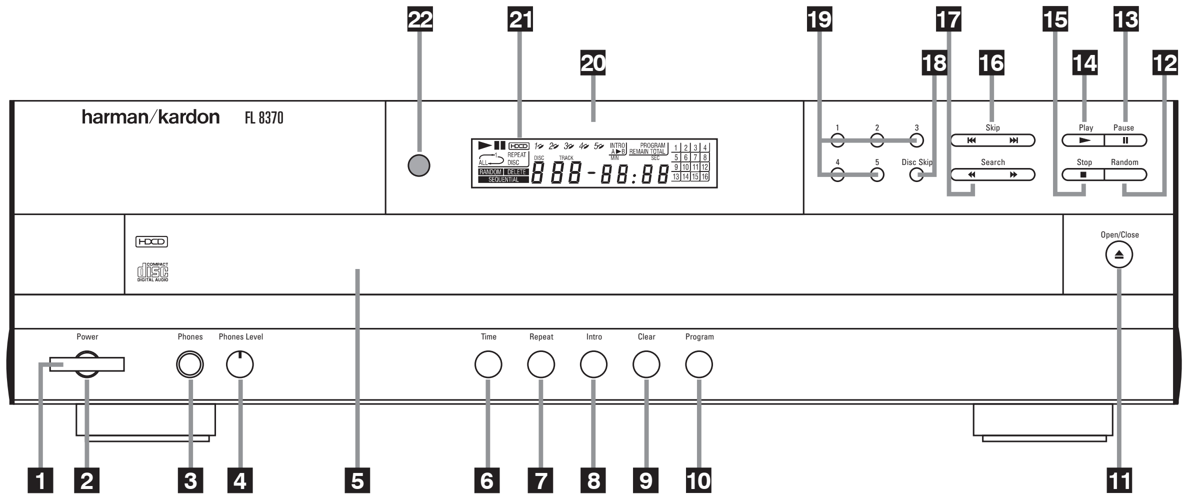
Test Disc Specification

	Typical	Limit
Black Dot TCD 726	1000um	600um
Interruption TCD 726	900um	600um
Finger print TCD 726	75um	65um
Vertical Deviation MCD-151	0.92mm	0.92mm
Eccentricity TCD 712	140um	140um
8cm test disc TCD 783	Last Track	Last Track
Access Time 1st to last track YEDS18	4 sec	10 sec

REAR PANEL CONNECTIONS

1. Audio Out: Red/White color RCA jacks
2. Remote In: ∅3.5mm mono phone jack; optical isolated
3. Remote Out: ∅3.5mm mono phone jack
4. Digital Out: Black color RCA jack
5. Power Cord: H03VVH2-F 6 feet VDE plug for Europe; SPT-2 double insulation 6 feet ULP plug for US

Front Panel Controls



1 **Power Switch**: Press this switch to apply power to the Fl8370. When the FL 8370 is first turned on by pressing this switch, the **Status-Mode Indicator** 2 will turn green, and the **Information Display** 20 will illuminate. Press the switch again to turn the unit off; the **Status-Mode Indicator** will turn amber, indicating that the unit is in a Standby mode. When the FL 8370 is connected to a switched AC outlet, such as those found on the back of many audio products, it will return to the Standby mode when power is applied to the switched outlet without any further press of the switch.

2 **Status Mode Indicator**: When the Fl8370 is in the ON mode, this indicator will glow green. When the unit is off, the indicator will glow amber, indicating that the unit is still connected to the AC mains supply.

3 **Headphones Jack**: Connect a set of standard headphones to this jack for private listening.

4 **Headphones Level Control**: Turn this knob to increase or decrease the volume level for headphones connected to the FL8370's **Headphones Jack** 3. Note that changing this level will not change the sound level for the unit's main output, as that remains constant.

5 **CD Drawer**: This drawer holds the discs that will be played. Press the **Open/ Close** button 11 to open the drawer so that discs may be inserted.

6 **Time Button**: Press this button to select the time display. In normal operation, this display will show the running time of the track being played. Press the button once to check the time remaining for the track in play. Press this button again to view the total play time remaining for the disc in play.

7 **Repeat Button**: Press this button once to constantly repeat the track currently being played. Press it a second time to repeat the entire disc.

8 **Intro Button**: Press this button to put the Fl8370 in the Intro Scan mode. When you press the button, the unit will play the first 10 seconds of each track on the disc, and then move to the next track. Press the button again to defeat the function and continue full play of the current track.

9 **Clear Button**: Press this button to remove tracks from a programmed sequence. Each press of the button will remove one track, starting with the last track programmed to play.

10 **Program Button**: This button is used to program the playback of a disc in a particular order.

11 **Open/ Close Button**: Press this button to open or close the disc drawer. DO NOT push the drawer to close it or damage to the transport mechanism may result.

12 **Random Button**: Press this button to put a disc into play, and to have all of the tracks played in a random order.

13 **Pause Button**: Press this button once to momentarily pause a disc. When the button is pressed again, the disc will resume play at the point it was paused.

14 **Play Button**: Press this button to start the playback of a CD. If the CD drawer is open, pressing this button will automatically close the drawer.

15 **Stop Button**: Press this button to stop the disc currently being played.

16 **Skip Button**: Press one side of this button to move to the next track ►►| or the other side of the button to |◄◄ move back to the previous track on the disc being played.

17 **Search Button**: Press one side of this button to search forward ►► or the other side of the button to search backwards ◄◄ through a disc to locate a particular portion of the disc being played.

18 **Disc Skip Button**: Press this button to change to the next disc. If a disc position is empty, the FL8370 will automatically search for the next position that contains a disc.

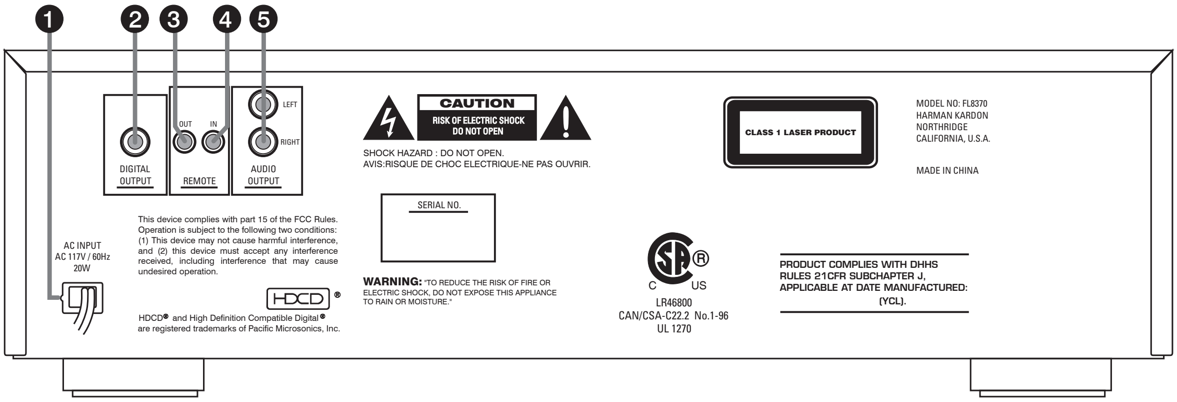
19 **Disc Select Buttons**: Press one of these buttons to select the disc in a specific position in the CD drawer.

20 **Information Display**: This display provides details about the operation of the FL 8370.

21 **HDCD Indicator**: This LED will light automatically when a CD with HDCD encoding is playing. No further action is needed to enjoy the benefits of HDCD.

22 **Remote Sensor**: The sensor behind this window receives commands from the remote control. Keep this area clear if you wish to use the FL 8370 with a remote control.

Rear Panel Connections



1 AC Power Cord
Connect this plug to an AC outlet. If the outlet is switch controlled, make certain that the switch is in the ON position.

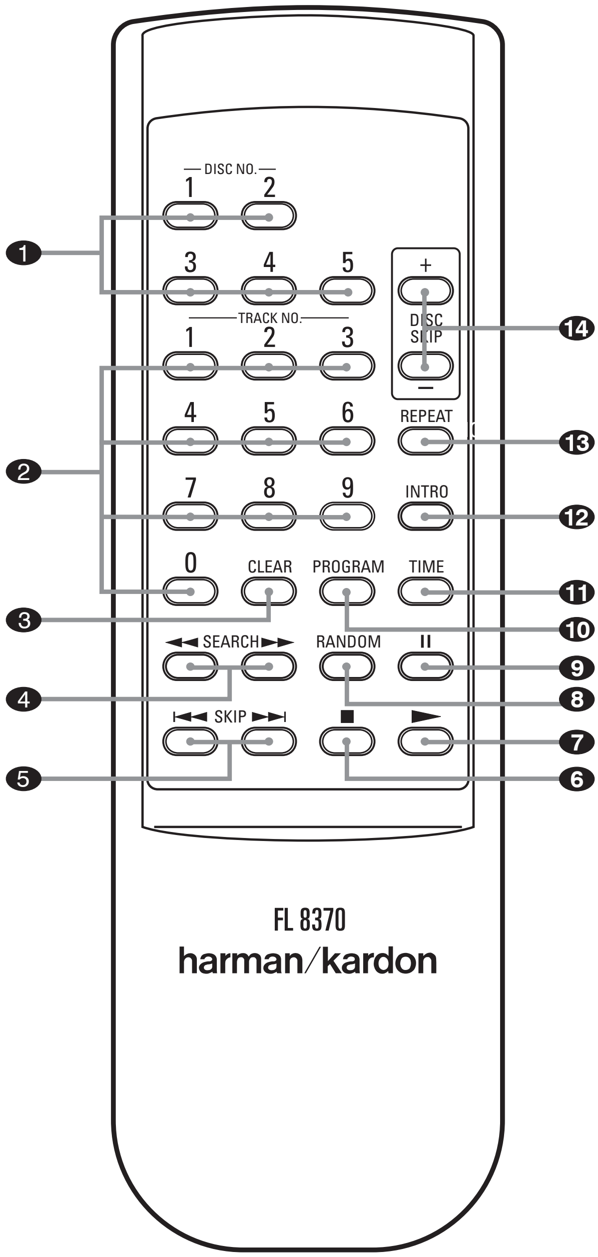
2 Coaxial Digital Output
Connect this jack to the coaxial-digital input of a digital audio/ video receiver or an external digital-to-analog converter for direct access to the digital signals of the FL8370. DO NOT connect this jack to the standard audio inputs of any device.

3 Remote Control Input
Connect this jack to the input of anther compatible Haman Kardon remote controlled device to have the remote sensor on the Fl8370 provide signals to other products.

4 Remote Control Output
Connect this output of a remote infrared sensor or the remote control output of another compatible Harman Kardon product. This will enable the remote control system to operate even when the front panel **Remote Sensor** 21 is blocked. It will also allow use of the Fl8370 with optional, external control systems.

5 Fixed Audio Outputs
Connect these jacks to the analog CD audio inputs of your receiver, surround processor or preamplifier.

Remote Control Functions



1 **Disc Select Buttons:** Press one of these buttons to select the disc in a specific position in the CD drawer.

2 **Numeric Buttons:** Press these buttons to select a specific track on a disc. The FL8370 will immediately go to the track and begin to play it. These buttons are also used to enter track numbers into the memory for preprogrammed-play lists.

3 **Clear Button:** Press this button to remove tracks from a programmed sequence. Each press of the button will remove one track, starting with the last track programmed to play.

4 **Search Buttons:** Press these buttons to search forward ►► or backwards ◄◄ through a disc to locate a particular portion of the selection being played.

5 **Skip Buttons:** Press one of these buttons to move to the next track ►►I, or to move back to the previous track I◄◄ on the disc being played.

6 **Stop Button:** Press this button to stop the disc currently being played.

7 **Play Button:** Press this button to start the playback of a CD. If the CD drawer is open, pressing this button will automatically close the drawer.

8 **Random Button:** Press this button to play all of the tracks on a disc in a random order.

9 **Pause Button:** Press this button once to momentarily pause a disc. When the button is pressed again, the disc will resume play from the point at which it was paused.

10 **Program Button:** This button is used to program the playback of a disc in a particular order.

11 **Time Button:** In normal operation, the display will show the running time of the track being played. Press the button once to check the time remaining for the track in play. Press the button again to view the total play time remaining for the disc in play.

12 **Intro Button:** Press this button to put the FL8370 into the Intro Scan mode. When you press this button, the unit will play the first 10 seconds of each track on the disc, and then move to the next track. Press the button again to defeat the function and continue full play of the current track.

13 **Repeat Button:** Press this button once to continuously repeat the track currently being played. Press it a second time to repeat the entire disc.

14 **Disc Skip Button:** Press this button to change to the next disc. If a disc position is empty, the FL8370 will automatically search for the next position that contains a disc.

Audio Characteristics Test Procedure

Test Equipment
1. 3346 CD Player Evaluating Filter x 2 (NF Electronic Instrument)
2. VP7722 Panasonic Audio Analyzer
3. Sony YEDS18 Test CD disc

Procedure
Equipment Setup
1. The audio output of the CD player under test is connected to the CD filter L & R inputs.
2. The outputs from the filter are connected to the Audio Analyzer.

Check the output Voltage
1. Set the mode of the filter to 'THRU'
2. Set the mode of Audio Analyzer to 'LEVEL' mode
3. Select track 2 of the test disc and play the CD disc
4. The output voltage and gain of the R & L channels are taken by pressing the respective buttons on the control board of Audio Analyzer.

Frequency Response
1. Set the mode of the filter to reference level mode.
2. Select the track 3, 4, 5, and 6 of the test disc and run it under 'Play' mode.
3. Check the output of the R & L Channels

Total Harmonic Distortion
1. Set the mode of the filter to 'DIST/CH-SP' mode
2. Set the audio analyzer to 'DIST' mode.
3. Set the unit of the audio analyzer to '%' mode
4. Select the track 2, 4, and 5 on the test disc and run them under 'PLAY' mode
5. Check the % of each R & L channels

Signal to Noise Ratio

1. Set the mode of the filter to 'S/N' mode
2. Play track 2 of the test disc
3. The unit of the audio analyzer is set to dB mode
4. Press the S/N key on the control panel of the audio analyzer
5. Play track 7
6. Measure the data of S/N ratio

Dynamic Range

1. Set the mode of the filter to 'D-Range' mode
2. Set the audio analyzer to 'DIST' Mode
3. Set the unit of the audio analyzer to 'dB' mode
4. Play track 17of the test disc
5. The dynamic range should be |A| + 60dB

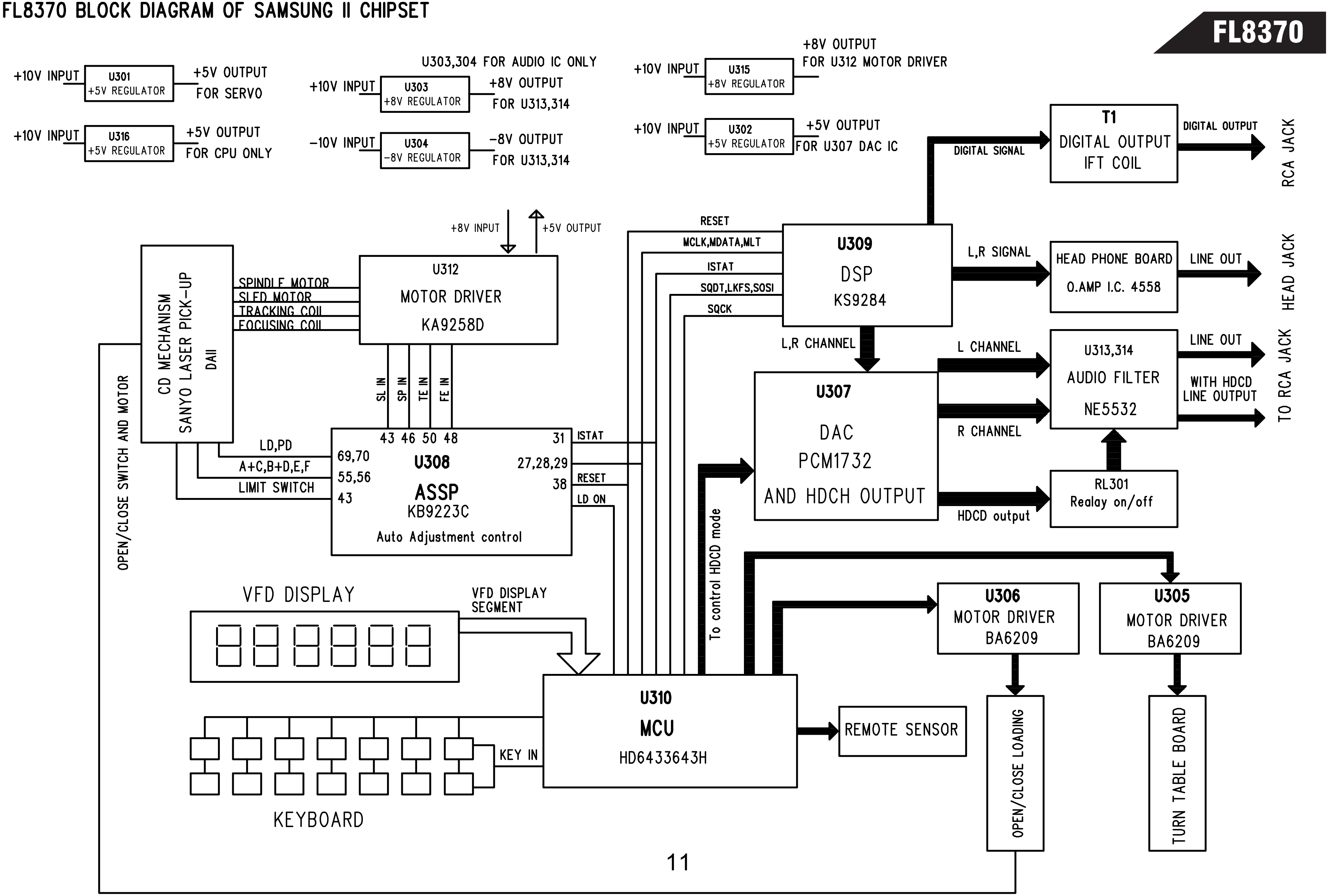
Channel Separation

1. Set the mode of the filter to 'DIST/CH-SP' mode
2. Set the audio analyzer to 'LEVEL' mode
3. Play the tracks 8, 9, 10 & 11
4. The measured results is the difference between L & R channel

De-emphasis

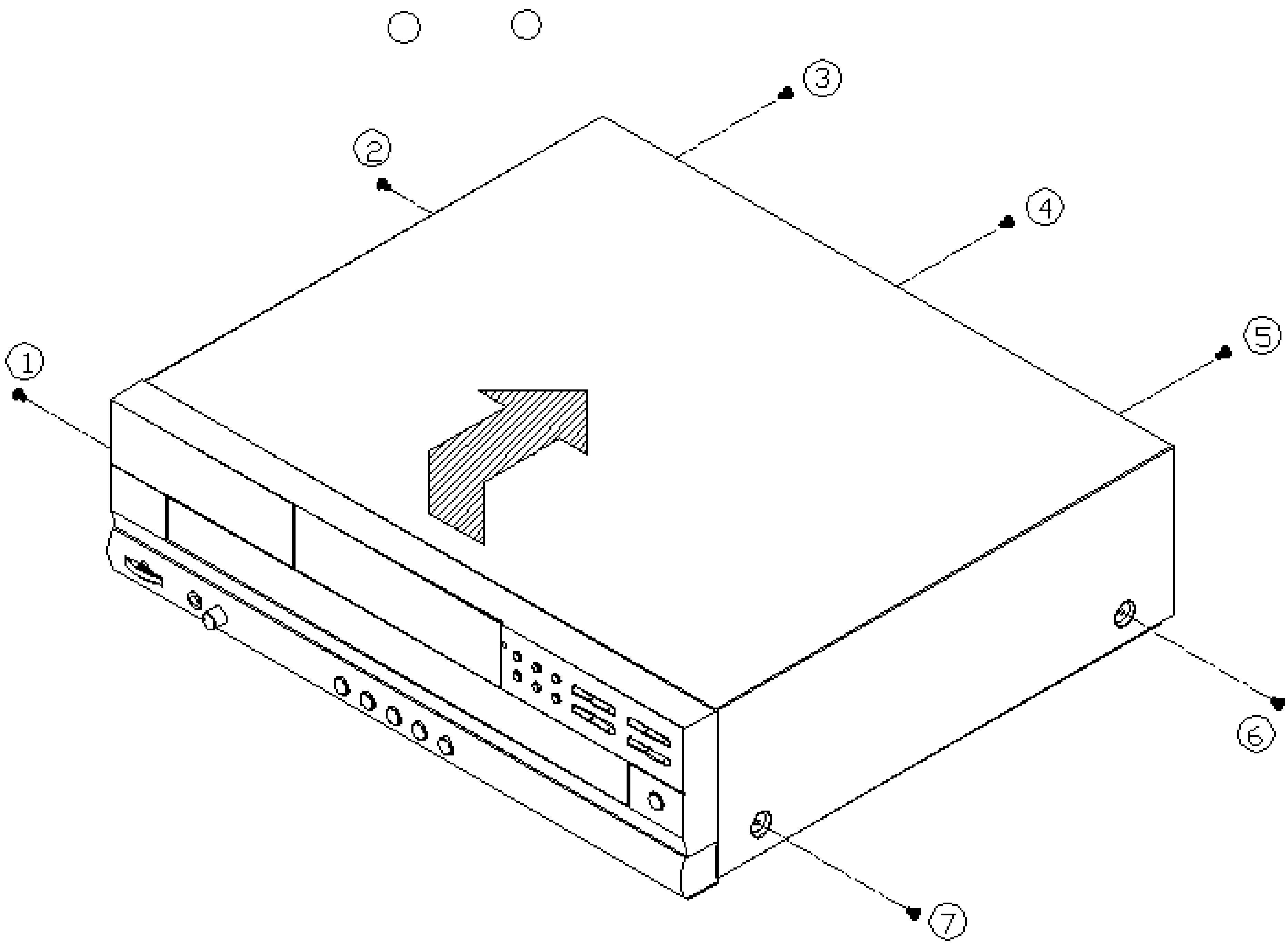
1. Press the 'THRU' button of the CD filter
2. Play the track 2 of the test disc
3. Press the 'Relative Level' and make it 'ON'
4. Select the track 12 and 13 and measure the L & R channels value

FL8370 BLOCK DIAGRAM OF SAMSUNG II CHIPSET

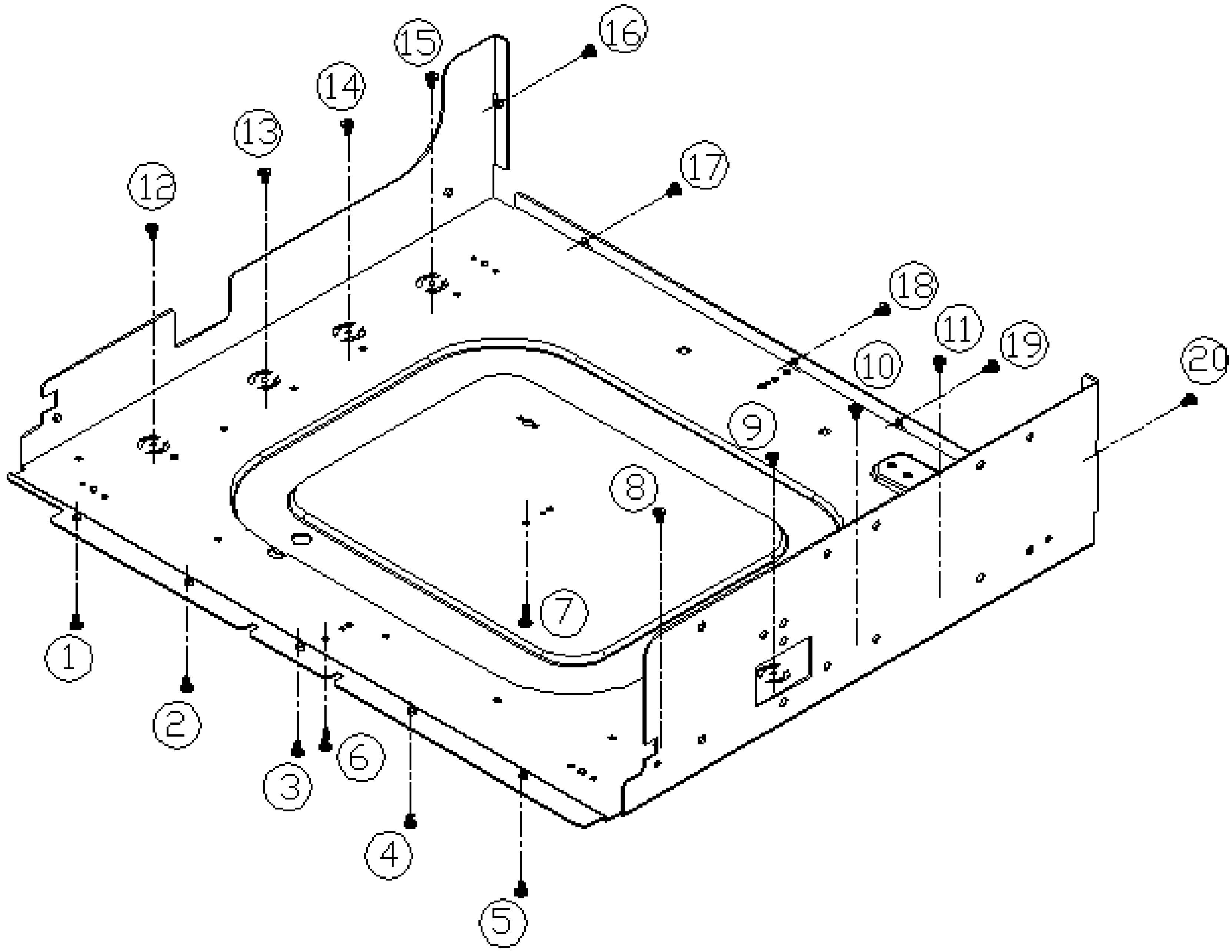


DISASSEMBLY INSTRUCTIONS

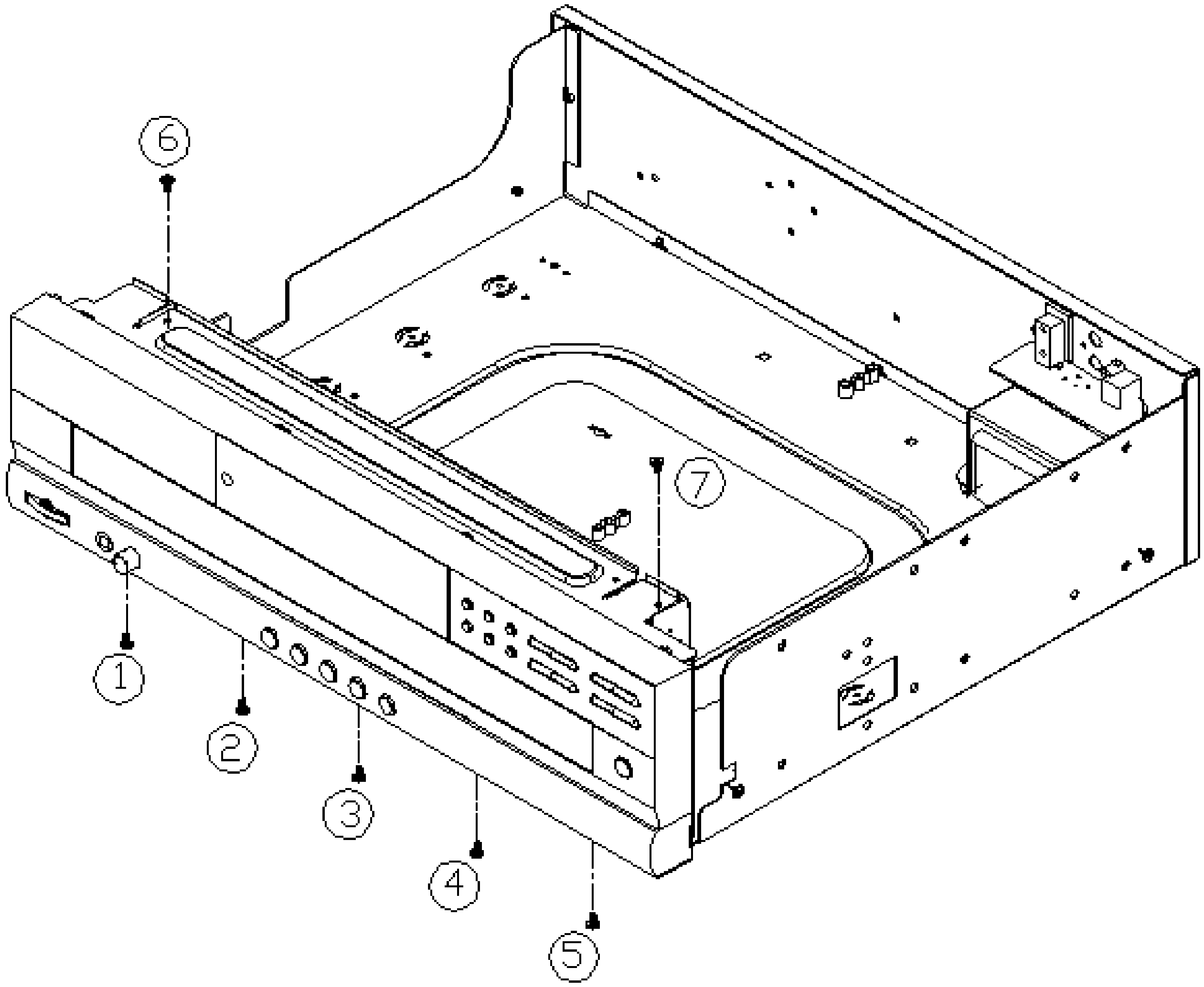
1. Removing the top cover.
1) Remove 7 screws (1 to 7) holding the top cover.



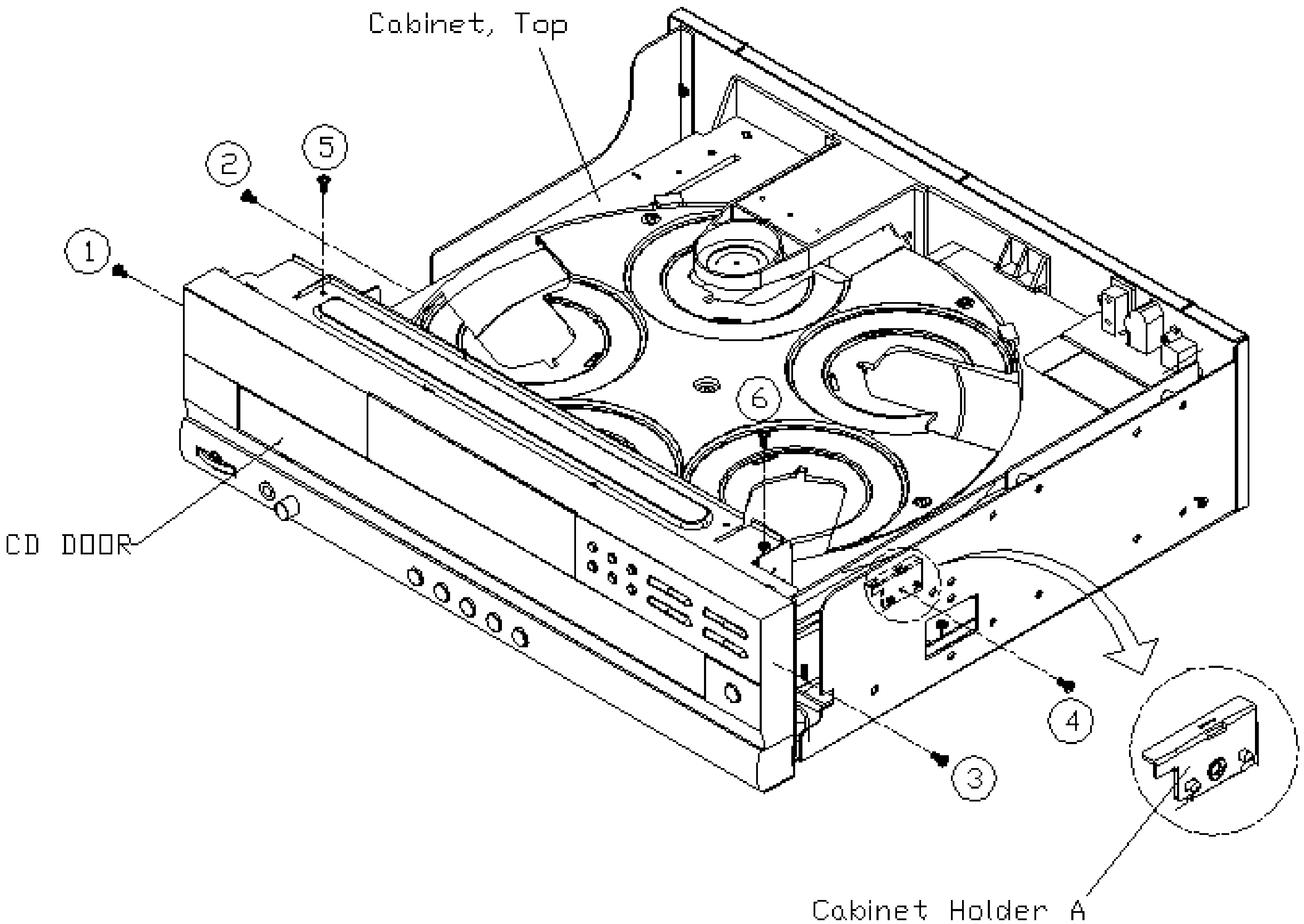
2. Removing the bottom cover.
1) Turn the set over.
2) Remove 15 screws (① to ⑮) from the bottom chassis.
3) Remove 5 screws (⑯ to ⑳) from the back chassis.



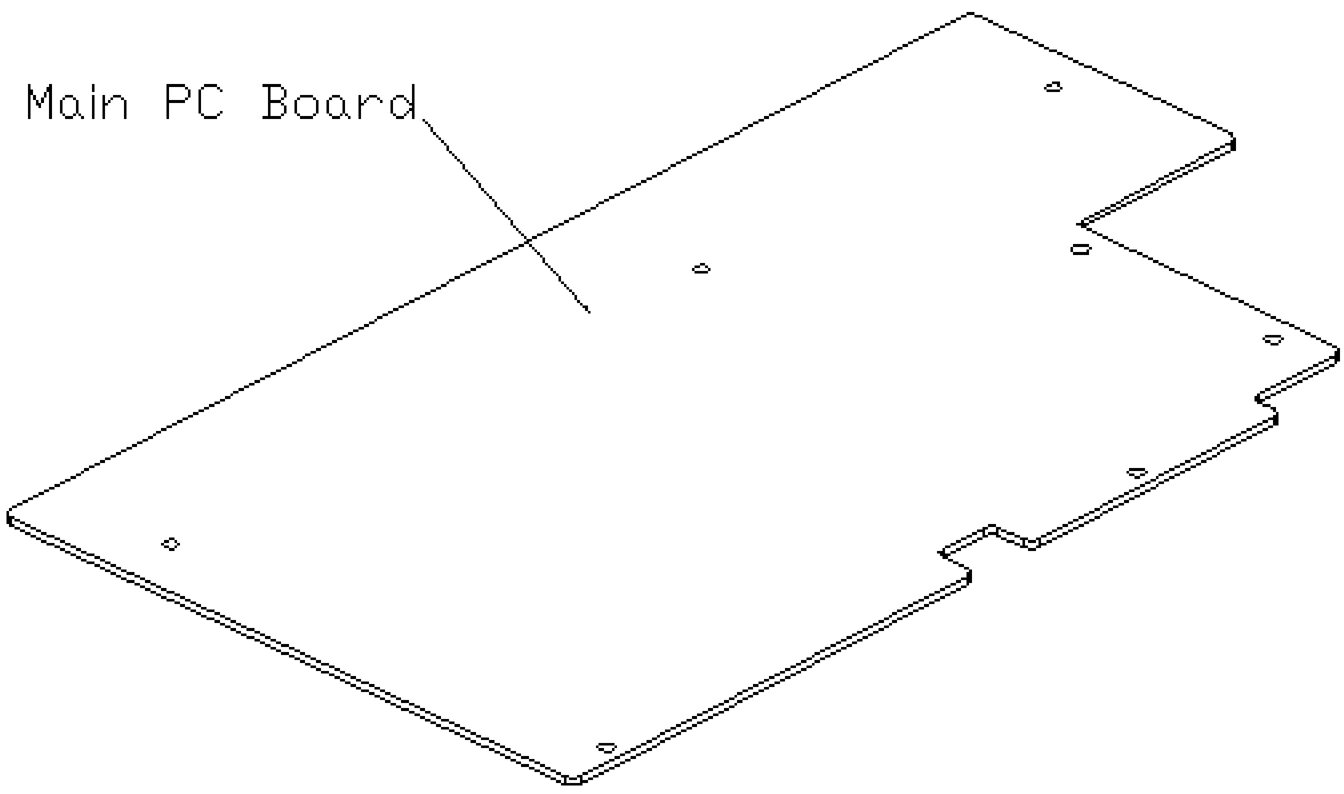
3. Removing the front panel.
1) Remove 5 screws (① to ⑤).
2) Remove 2 screws (⑥ to ⑦) from the metal of front panel.
3) Hold the front panel and pull it up.
4) Remove 2 connectors (CN501 , CN502) from the phones board.



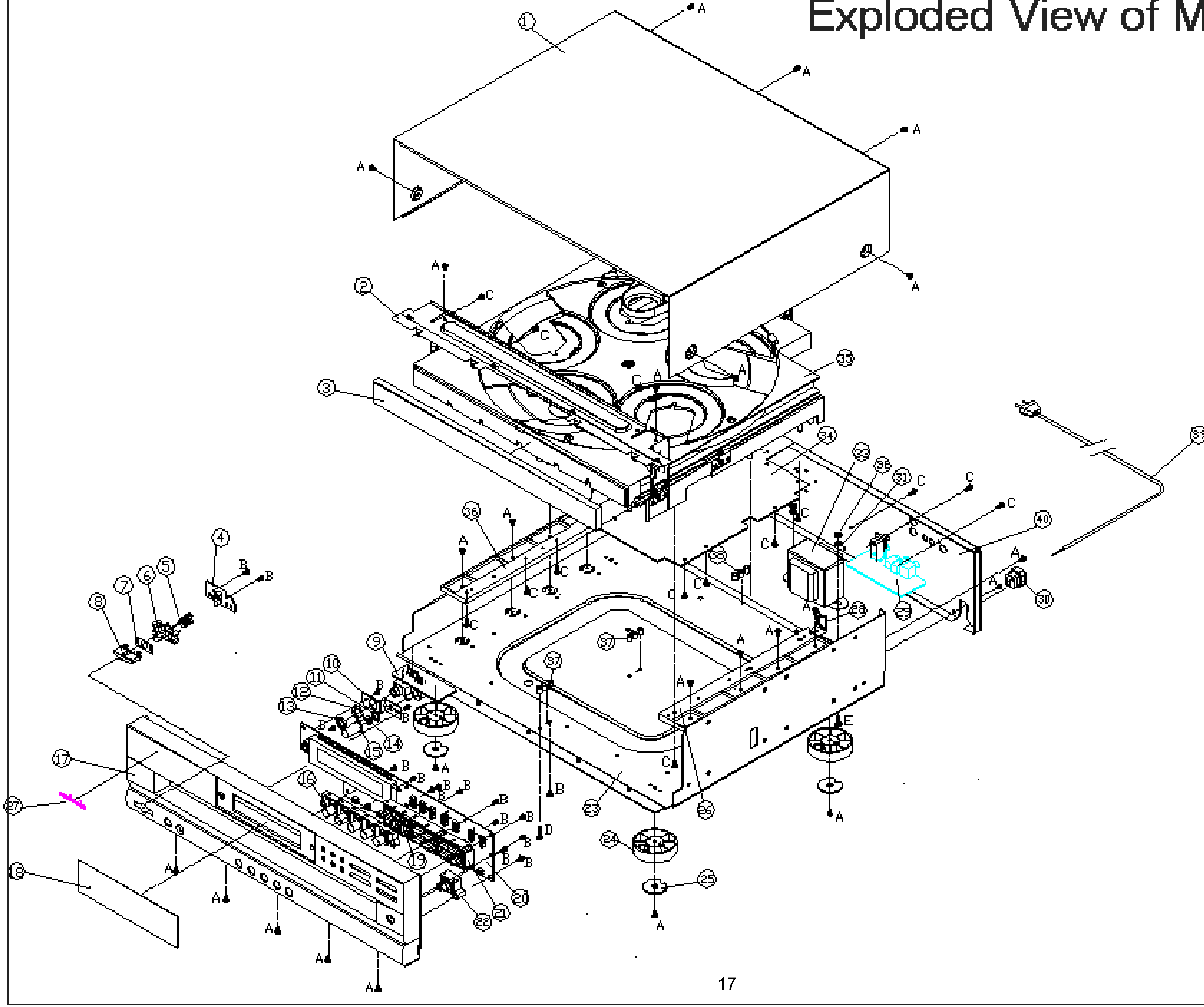
4. Removing the loading table (Cabinet,Top)
1) Remove 4 screws (① to ④) holding the Cabinet holder A & B.
2) Remove 2 screws (⑤ to ⑥) Holder the metal frame.
3) Remove the Cabinet Holder A and B.
4) Remove and hold the loading table up.
5) Disconnect the 6 pins wire connector from main PCB Assembly.



5. Removing the main board .
1) Remove all screws holding the main board from mechanism.
2) Disconnect all lead assembly.



Exploded View of Main Unit



Model : FL8370 Exploded drawing List

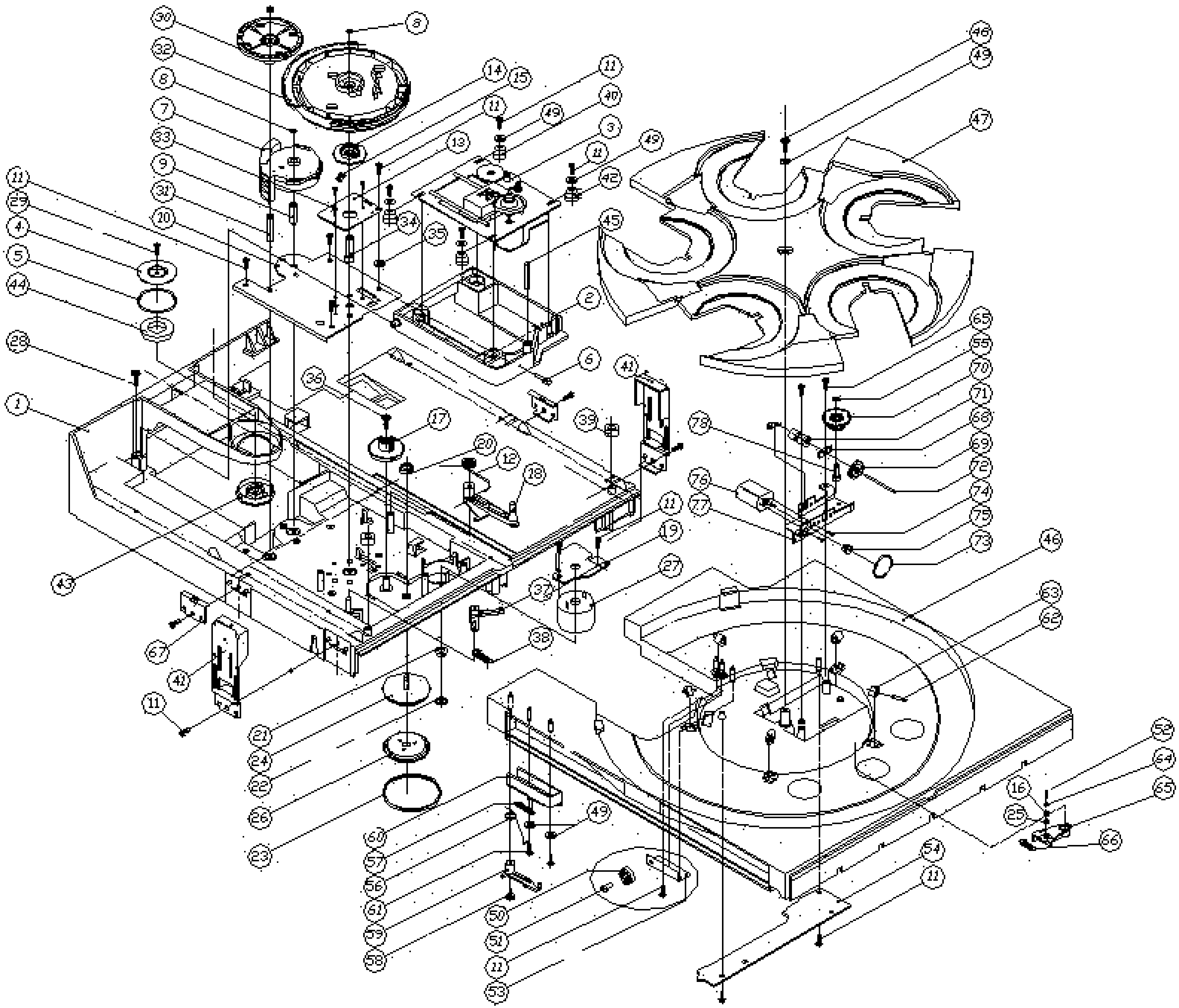
Rev. A

Date : 1999-08-21

Seq. No.	Parts No.	Parts Name	Material	Qty.
1	6583-510002-000-01	Top Cabinet, Painted		1
2	6583-510004-000	Bracket, Front Panel	SECC 1.0t	1
3	6083-510002-000-XX	Door, CD, silkscreen		1
4		PCB, Power, Assy		1
5	6600-010293-000	Spring, Power Switch		1
6	6083-510008-000	Lens, Power Knob	Acrylic ,transparence	1
7	6083-510015-000	Light Sheet, Black		1
8	6083-510007-000-XX	Knob, Power , Painted		1
10	6583-510006-000	Bracket, Phones (MIC)	SECC 0.8t	1
11	7107-212005-022	Washer M7		1
12	7112-517506-022	Washer M12		1
13	6600-120120-000	Nuts M12		1
14	6600-120070-000	Nuts M7		1
15	6083-510006-000-01	Knob, VR , Painted		1
16	6083-510005-000-01	Knob, Program , Painted		1
17	6083-510001-000-01	FL8350 Front Panel silkscreened		1
18	6083-510003-000-XX	Lens, Diaplay , silkscreen		1
19	6083-510004-000-01	Knob, Disc, Painted		1
20	9483-701000-261	VFD Board Assy		1
21	6083-510010-000-01	Knob, Play, Pianted		1
22	6083-510009-000-01	Knob, Open/Close, Painted		1
23	6583-510001-001	Bottom Cabinet	SECC 1.2t	1
24	6029-010012-000-01	Foot		4
25	6600-070003-000	Pad, Foot		4
26	6083-510014-000	Bracket, 5CD-Side 2	ABS, Black	1
27	6583-510008-000	Badge		1
28	6083-510016-000	Bracket, Wire		1
29	9483-701000-291	Output Board Assy		1
30	6600-180007-000	Bush, AC 5RF-5B		1
31	6600-120040-000	Nut M4		2
32	7104-010010-022	Washer M4X10X1mm		2
33		Transformer		1
34	9483-701000-011	Main PCB Assy		1
35	9600-505009-001	5CD Mechanism		1
36	6083-510013-000	Bracket, 5CD-Side 1	ABS, Black	1
37	6083-510011-000	Stand, Front -5CD	ABS, Black	2
38	6083-510012-000	Stand, Rear -5CD	ABS, Black	1
39		Power Cord		1
40	6583-510003-002-XX	Rear Cabinet, Silkscreen		1
A	7003-006001-111	Screw M3X6 STP B/H (Black)		22

B	7003-006002-112	Screw M3X6 PTP B/H	23
C	7003-008002-112	Screw M3X8 PTP B/H	15
D	7003-016002-112	Screw M3X16 PTP B/H Zn	3
E	7004-010010-112	Screw M4X10 B/H	2

Exploded drawing of CD Changer mechanism



Model : 5CD Exploded drawing List

Rev. A

Date : 1999-08-21

Seq. No.	Parts No.	Parts Name	Qty.
1	6505-050050-000	Base, 5CD	1
2	6505-050010-003	Bracket, CD Mecha	1
3	3009-110000-000	Mechan Unit (PU91T-001)	1
4	6590-050001-000	Chucking Metal Plate	1
5	6600-140001-000	Chucking Metal Plate Felt Ring	1
6	6600-020200-002	Pin, Round	1
7	6005-050008-001	Control Cam	1
8	7105-010005-030	Washer Lock 5X10X0.5	3
9	6600-020198-000	Pin, Control Cam	1
10	6505-050001-001	Bracket Gear	1
11	7003-008002-112	Screw M3X8 B Type B/H Zn	16
12	6600-010211-000	Spring, Lever Lock, Outer	1
13	4841-010700-005	Turntable PCB Rev. E	1
14	6005-050025-000	Switch Cover	1
15	6505-050007-000	Contact Plate	1
16	6600-170056-000	Rubber Ring 3.2X5.2X2	1
17	6005-050009-000	Intermediate Gear	1
18	6005-050014-004	Lever Lock, Outer	1
19	4800-310210-001	Loader Board Ver A	1
20	6005-050011-000	Idler Gear	1
21	6005-050023-001	Pulley Motor	1
22	6005-050024-000	Pulley Disc	1
23	6600-090053-000	Belt Motor Loading	1
24	6005-050013-000	Driven Pulley	1
25	6005-050027-000	Bush, Roller	1
26	6005-050012-000	Driven Pulley Plate	1
27	RF-500TB-11415 D/V9	Motor	1
28	7003-012002-062	Screw M3X12 PTP W/H	1
29	7002-605002-112	Screw M2.6X5 PTP B/H Zn	1
30	6005-050007-000	Gear, Cabinet Top	1
31	6600-020197-000	Pin, Gear, Cabinet Top	1
32	6005-050006-001	Cam Cabinet	1
33	7002-006001-022	Screw M2X6 STP P/H	2
34	6600-020196-002	Pin , Cam Cabinet	1
35	7103-012010-022	Washer M3X12X1mm	4
36	7003-008002-062	Screw M3X8 P Type W/H Zn	1
37	6005-050015-000	Lever Lock	1
38	6600-010210-000	Spring Lever Lock	1
39	6600-170021-000	Cushion Ring	2
40	6600-170076-000	Cushion 5CD, 30deg. Black	2

41	6505-050003-001	Cabinet Holder B	2

Model : 5CD Exploded drawing List

Rev. A

Date : 1999-08-21

Seq. No.	Parts No.	Parts Name	Qty.
42	6600-170077-000	Cushion 5CD, 40deg. Grey	2
43	6090-050002-003	Chucking Pulley	1
44	6600-150006-000	Chucking Magnet	1
45	6600-020199-001	Pin, Lock	1
46	6005-050002-005	Cabinet Top	1
47	6005-050001-005	Turntable	1
48	7003-012002-062	Screw M3X12 PTP W/H	1
49	7103-209008-022	Washer M3.2X9X0.8	7
50	6005-050017-000	Roller	1
51	6600-020202-000	5CD Pin, Roller	1
52	6600-020297-000	Pin, Roller Lock	1
53	6505-050005-000	Bracket, Roller	1
54	9400-501000-131	Sensor Board Assy Rev.A	1
55	7103-006005-130	Washer 3X6X0.5mm Cut	1
56	6600-010213-000	Spring, Gear Block Arm	1
57	6600-010212-000	Spring, Gear Block	1
58	7002-620002-062	Screw M2.6X20 P Type W/H Zn	1
59	6005-050005-001	Gear Block Arm	1
60	6005-050004-003	Gear Block	1
61	7002-608002-062	Screw M2.6X8 W/H P.T.P.	2
62	6600-020203-000	Shaft, T.T. Roller	5
63	6600-080001-000	YN21R 03/04 Pinch Roller	5
64	6005-050028-000	Washer, Bush	1
65	6005-050026-000	Lever Lock, T.T.	1
66	6600-010290-001	Spring, Lever Lock	1
67	6505-050002-001	Cabinet Holder A	2
68	6005-050019-000	Shaft Bushing	2
69	6005-050020-000	Pulley Rotary	1
70	6005-050021-000	Gear Rotary	1
71	6005-050022-000	Gear Worm	1
72	6600-020268-000	Shaft Dia. 2X34mm	1
73	6600-090052-000	Belt Rotary	1
74	7002-003010-111	Screw M2X3 B/H (Black)	2
75	6005-050018-000	Motor Pulley	1
76	FF-130SH-11340-2684A	Motor FF-130SH-11340-2684A	1
77	6505-050004-004	Motor Bracket	1
78	6600-020201-001	Shaft, Gear Rotary	1

FUNCTION DESCRIPTION

1.RF Amp Block

1.1 RF Amplifier

The optical currents inputted through pins PD1(A+C) and PD2(B+D) are converted into voltages through I-V amp, and they are added to RF summing amp. The voltage, converted from the photo diode (A+B+C+D) signal, is outputted through RFO(pin74) and the eye pattern can be checked at this pin.

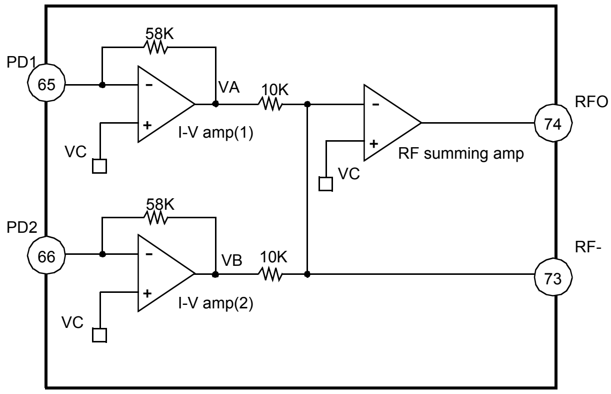


Figure 4. RF amp circuit

1.2 Focus Error Amp

The output of the focus error amp is the difference between I-V amp(1) output VA and

RF I-V amp(2) output VB. The focus error bias voltage applied to the (+) of focus error amp can be changed by output voltage of D/A converter as shown in diagram, so that the offset of focus error amp can be adjusted automatically by controlling 5 bits counter switches. Focus error bias can be adjusted from the range of +100mV ~ -100mV by connecting the resistor on pin 63 (FEBIAS).

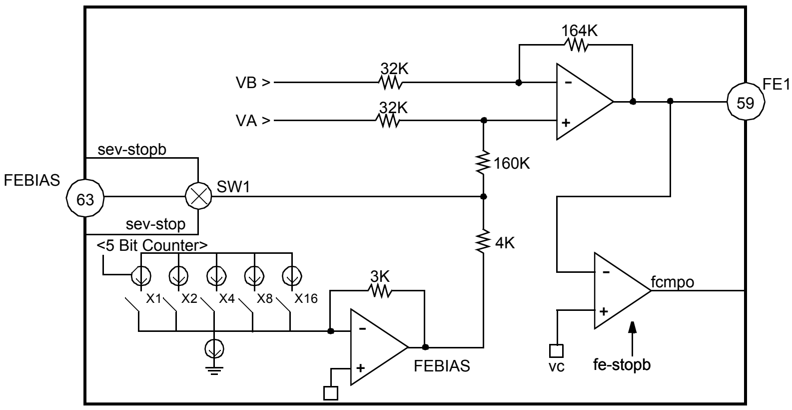


Figure 5. Focus error amp circuit

note1> VA and VB refer to output signal of PD1 and PD2 I/V amp.

note2> sev-stopb,sev-stop,fe-stopb and fcmpo are internal signals

1.3 Tracking Error Amp

The optical currents detected from the side photo diode (E and F) pf pick-up are inputted to the E and F pin and converted into voltage signals by E I-V and F I-V amp. The output of tracking error amp generates the difference between E I-V AMP and F I-V AMP voltage output.

The E-F balance can be adjusted by modifying the gain of E I-V AMP, and the tracking gain can be adjusted automatically by controlling the peak voltage at pin TE2 by micom program.

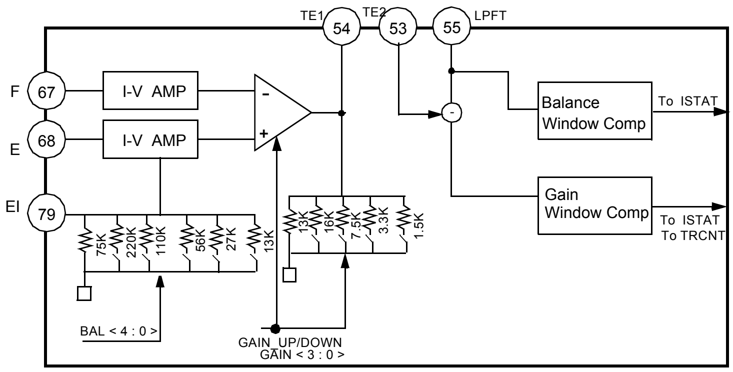


Figure 6. Tracking error amp circuit

1.4 Focus OK Circuit

The FOK is the output. The focus OK circuit generates a timing window to enable focus servo operation from focus search status. When the difference of the RFO (pin74)signal and DC coupled signal IRF(pin75) are above the predefined voltage the Focus OK circuit output (pin40) becomes active(High output). The predefined voltage is -0.39V

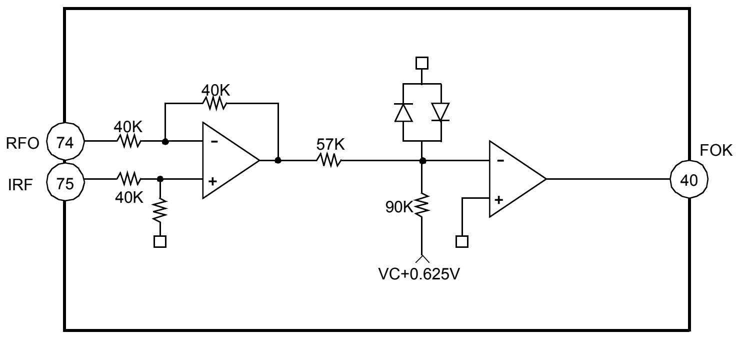


Figure 7. Focus OK circuit

1.5 Mirror Circuit

IRF signal is amplified by the mirror amp, and the peak and bottom component of amplified signal are detected by peak and bottom hold circuit. The peak hold circuit covers traverse signal of up to 100KHz component and bottom hold circuit capable of covering the envelope frequency of disc rotation. The time constant for the mirror hold must be sufficiently larger than that of the traverse signal.

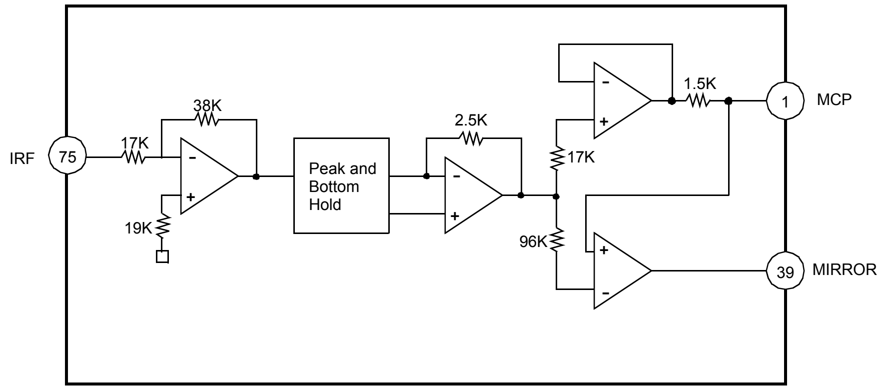


Figure 8. Mirror Circuit

1.6 EFM Comparator

The EFM comparator converts a RF signal into a binary signal.

Beacuse the asymmetry generated due to variations in disc manufacturing can not be eliminated by the AC coupling alone, this circuit uses to control reference voltage of EFM comparator for eliminating asymmetry.

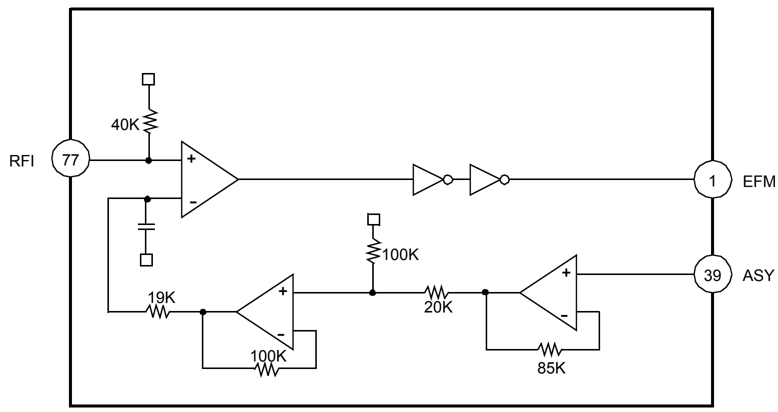


Figure 9. EFM Comparator & asymmetry circuit

1.7 Defect Circuit

The RFO signal bottom, after being inverted, is held with two time constants of long and short.

The short time-constant bottom hold is done for a disc mirror defect more than 0.1msec, the long time-constant bottom hold is done with the mirror level prior to the defect. By differentiating this with a capacitor coupling and shifting the level, both signals are compared to generate the mirror defect detection signal.

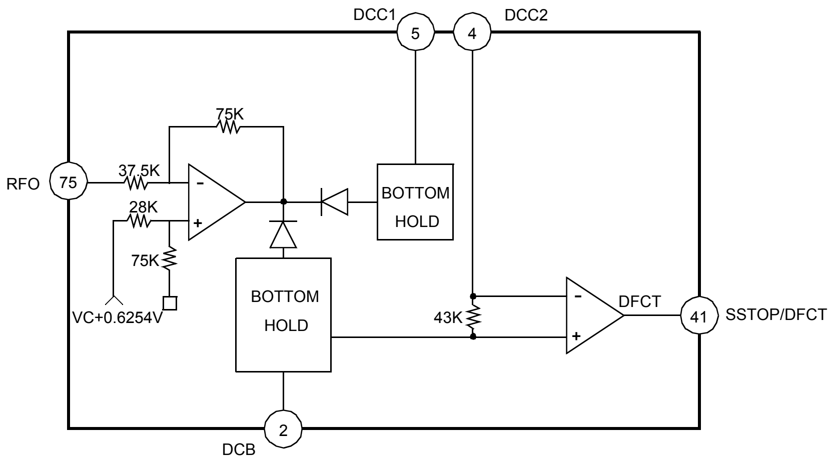


Figure 10. Defect Circuit

1.8 APC (Auto Power Control) Circuit

The laser diode has large negative temperature characteristic in its optical output when driven with a constant current on laser diode. Therefore, the output on processing monitor photo diode, must be a controlled current for getting regular output power, thus the APC (Auto Power Control) circuit is composed.

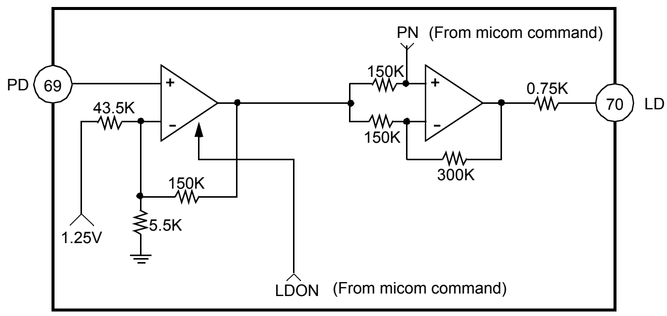
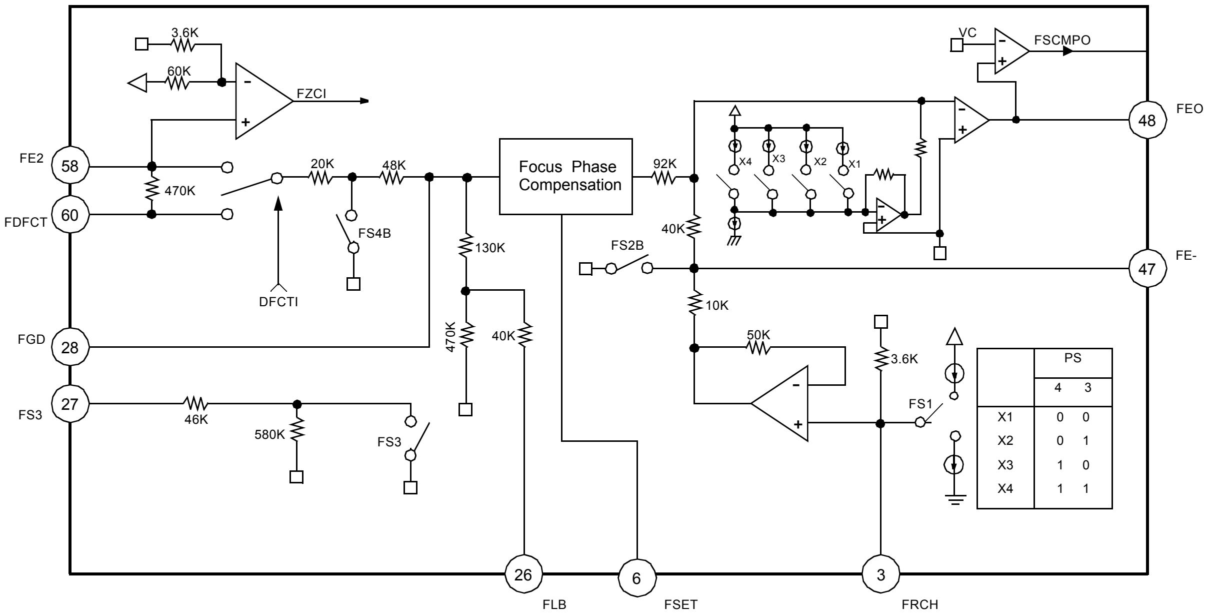


Figure 11. APC Circuit

2.Servo Block

2.1 Focus Servo Block

When defect is "H"(the defect signal is detected), the focus servo loop is muting in case of focus phase compensation. At this time, the focus error signal is outputted through the low pass filter formed by connecting a capacitor(0.1uF) and a built-in 470KΩ resistor to the FDFCT pin(pin 60). Accordingly, the focus error output is held at the error value just before defect error during defect occurring. The peak frequency of focus loop phase compensation is at about 1.2KHz when the resistor connected to FSET pin(pin 6) is 510KΩ, and it is inversely proportional to the resistor connected to the FSET pin. While the focus search is operating, the FS4 switch is on and then the focus error signal is isolated, accordingly the focus search signal is outputted by FEO pin(pin 48). When the FS2 switch is on(focus on), the focus servo loop is on and the focus error signal from FE2 pin(pin 58) is outputted through the focus servo loop.



	PS 4	PS 3
X1	0	0
X2	0	1
X3	1	0
X4	1	1

Figure 15. Focus servo block

2.2 Tracking Servo Block

During detection of defect, the tracking error signal is outputted through the tracking servo loop after passing the low pass filter formed by connecting a capacitor(0.1uF) and a built-in 470KΩ resistor to the TDFCT pin(pin57) in case of tracking phase compensation. The value of tracking gain up/down can be controlled by TGU and TG2 pin. The peak frequency of tracking loop phase compensation, the dynamic range and offset of opamp can be adjusted by changing the value of resistor connected to FSET pin same as focus loop. In case of unstable status of actuator after jumping, the ON/OFF of tracking loop is controlled by TM7 switch of break circuit.

After 10-track jumping, servo circuit gets out of the liner range and actuator's tracking becomes occasionally unstable. Hence unnecessary jumping with many tracking error should be prevented.

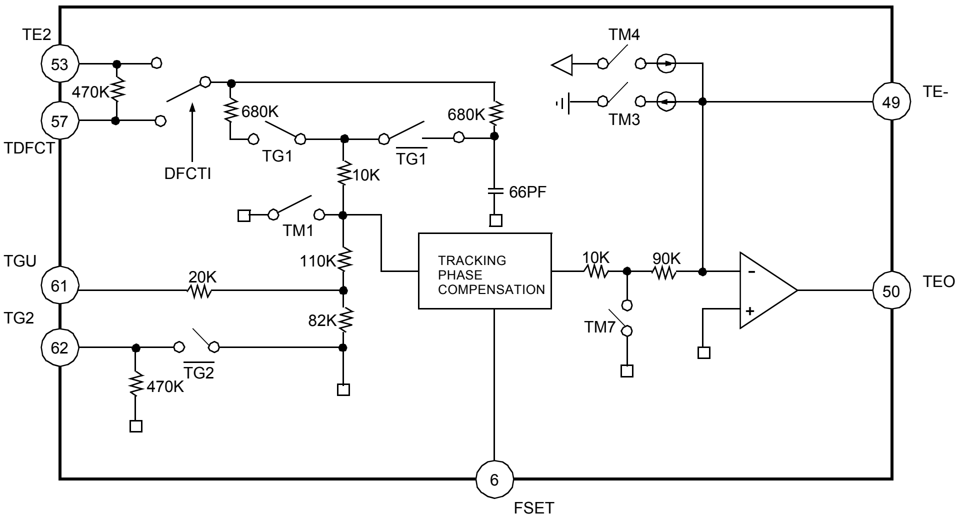


Figure 16. Tracking servo block

2.3 Sled Servo Block

The moving of pick-up is controlled by tracking servo output through a low pass filter. The sled kick voltage is outputted for track jump operation.

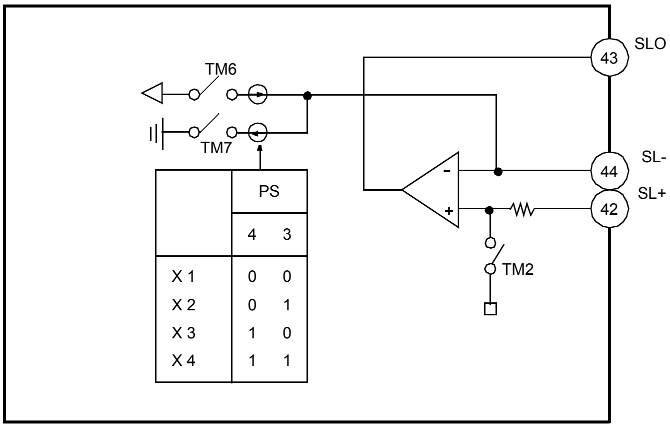


Figure 17. Sled servo block

2.4 Spindle Servo Block

The 20KΩ resistor and 0.33uF capacitor form the 200Hz low pass filter, and the carrier component of spindle servo error signals is eliminated. In CLV-S mode, SMEF becomes "L" and pin 25 low pass filter fc lowers, strengthening the filter further. The characteristics of high frequency phase compensation in focus tracking servo and the characteristics of cut off frequency in CLV low pass filter are tested by FSET pin.

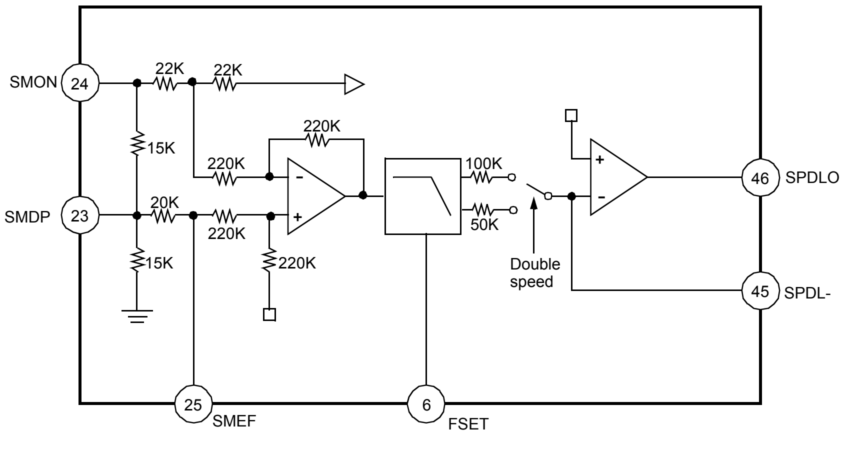
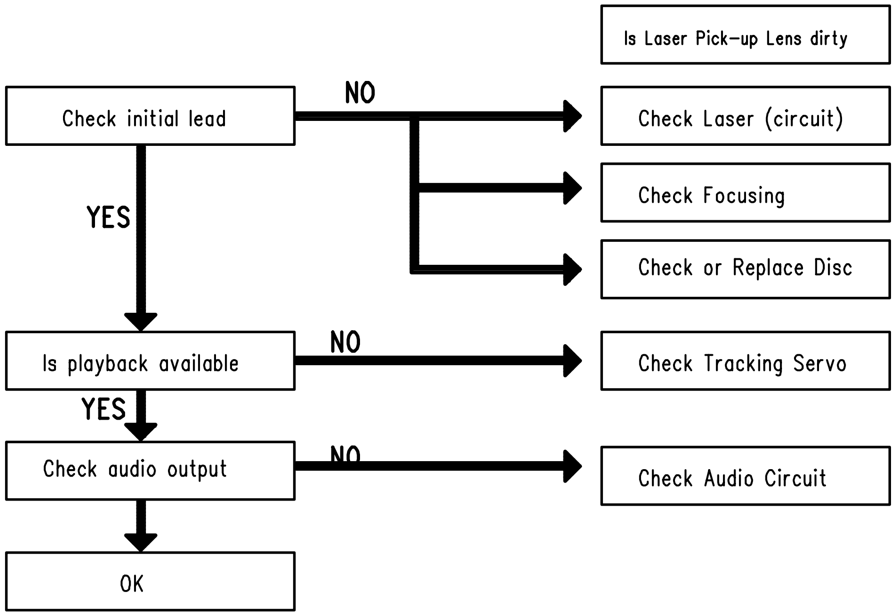


Figure 18. Spindle servo block

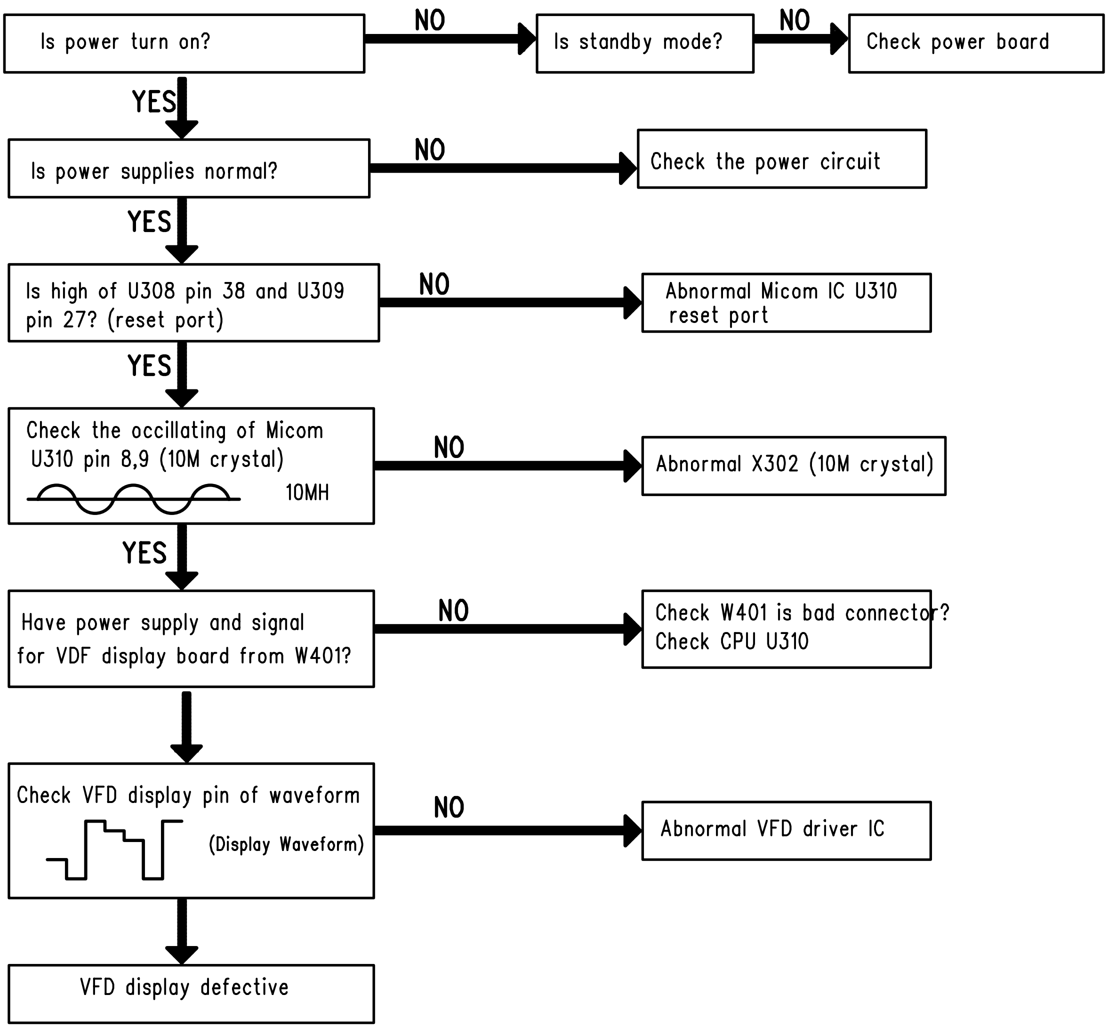
Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE	SOLUTION
No lights on front panel	• No AC power	• Make certain that the AC power cord is plugged into a live outlet
Remote does not appear to operate	• Main Power Switch turned off • Weak batteries • Blocked sensor	• Turn on Main Power Switch • Install fresh batteries, observing polarity indications • Remove obstructions from the front-panel sensor, or connect a remote sensor to the **Remote-In** jack on the rear panel
Front panel lights but CD does not play	• Disc upside down • Moisture inside unit	• Turn CD over so that label side faces up • Leave the unit turned ON for 30 minutes to allow moisture to evaporate
Play indicator lights but no sound is heard	• Poor connections • Wrong source selected	• Make certain connections are secure and made to the correct (e.g., **CD**) input • Select CD source on receiver or preamp
Sound skips or stutters during play	• Disc may be damaged • Surface vibrations	• Try another disc • Isolate the unit from vibration by placing it on a firm surface or move it further away from speakers
Sound is continually distorted	• Incorrect input	• Make certain that the FL 8370 is connected to a line-level audio input, NOT a digital audio or phono input

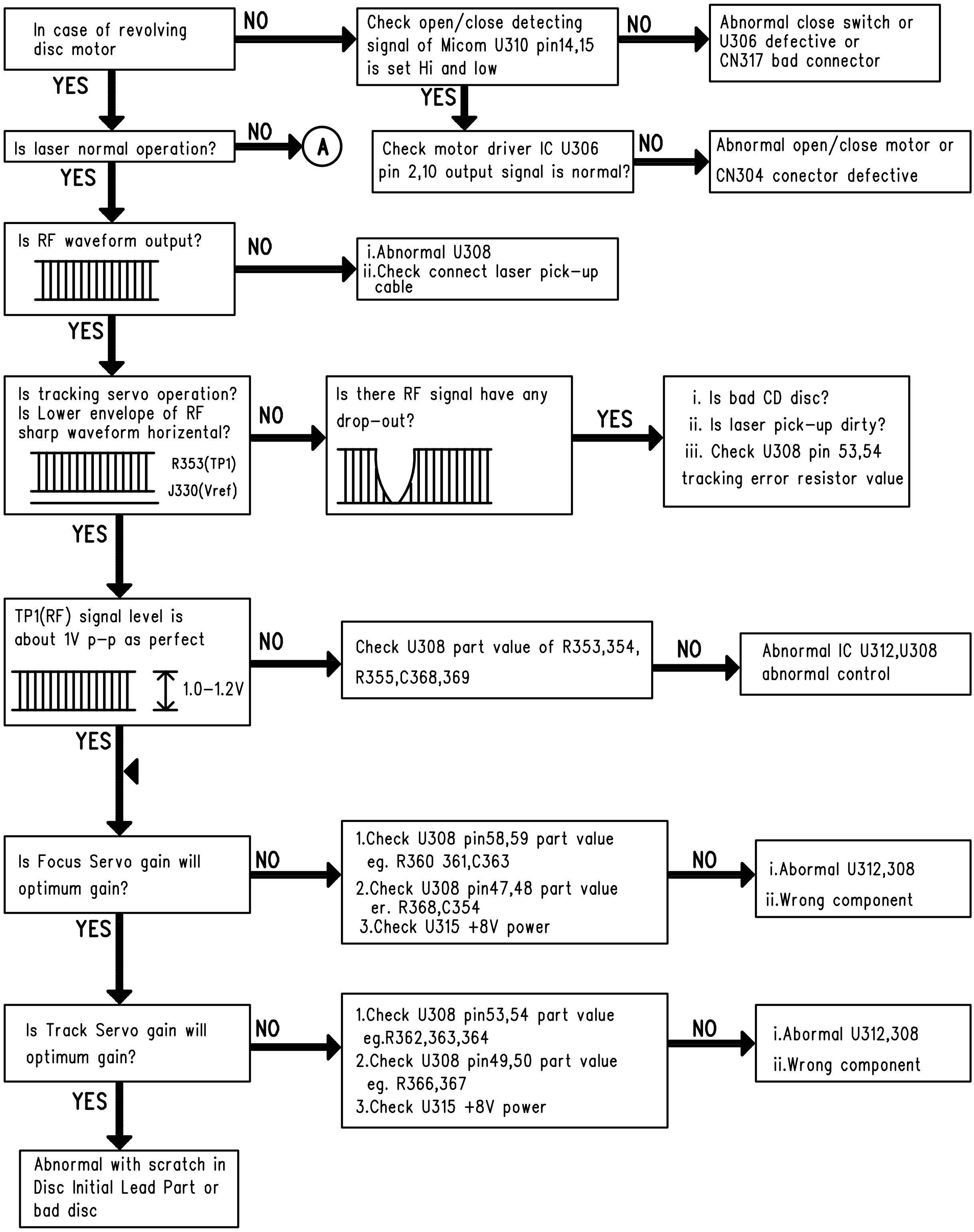
Chech CD Player Is Normal Operational?



In Case of Abnormal Indication

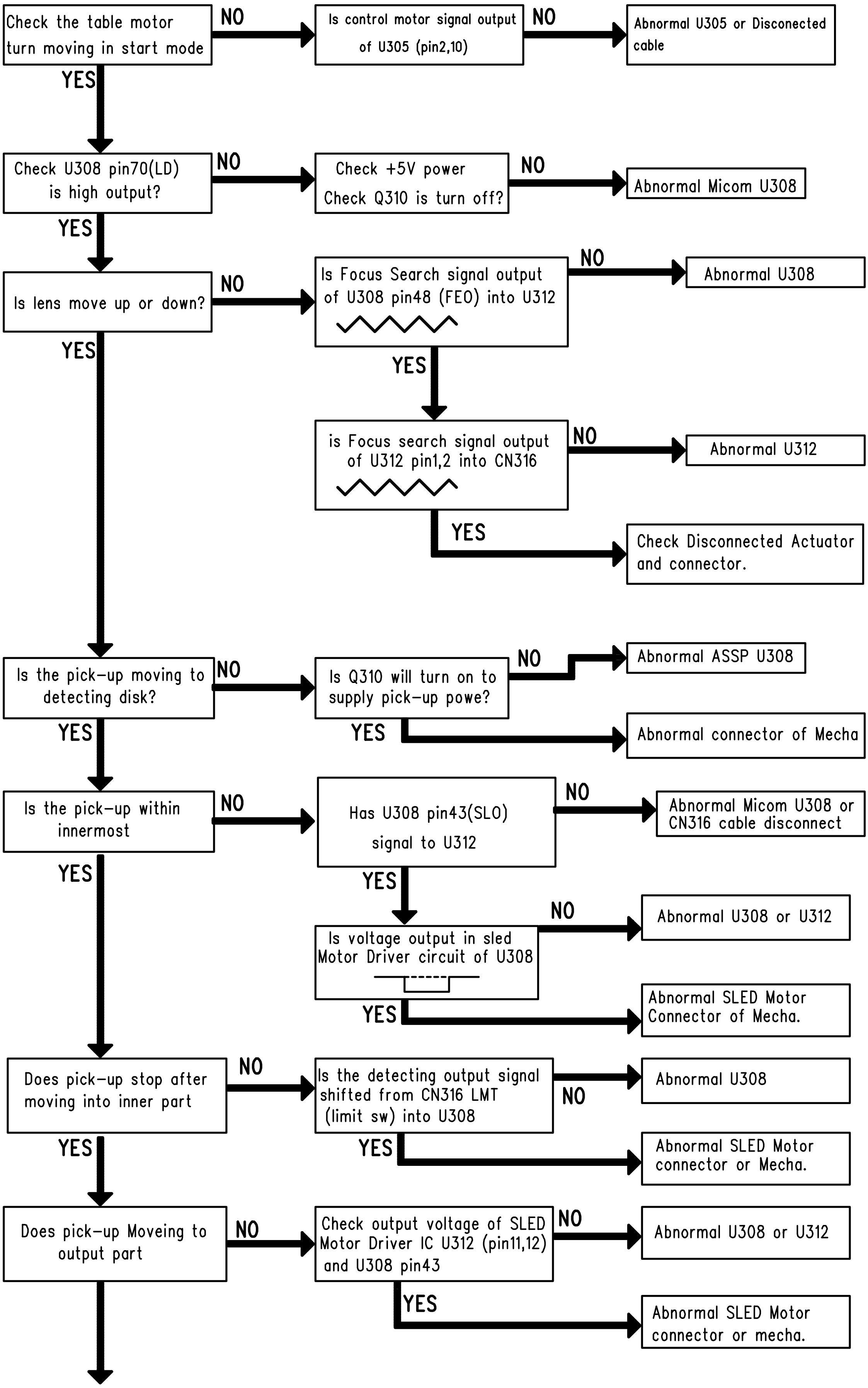


When Initial Lead-In Is Not Operational

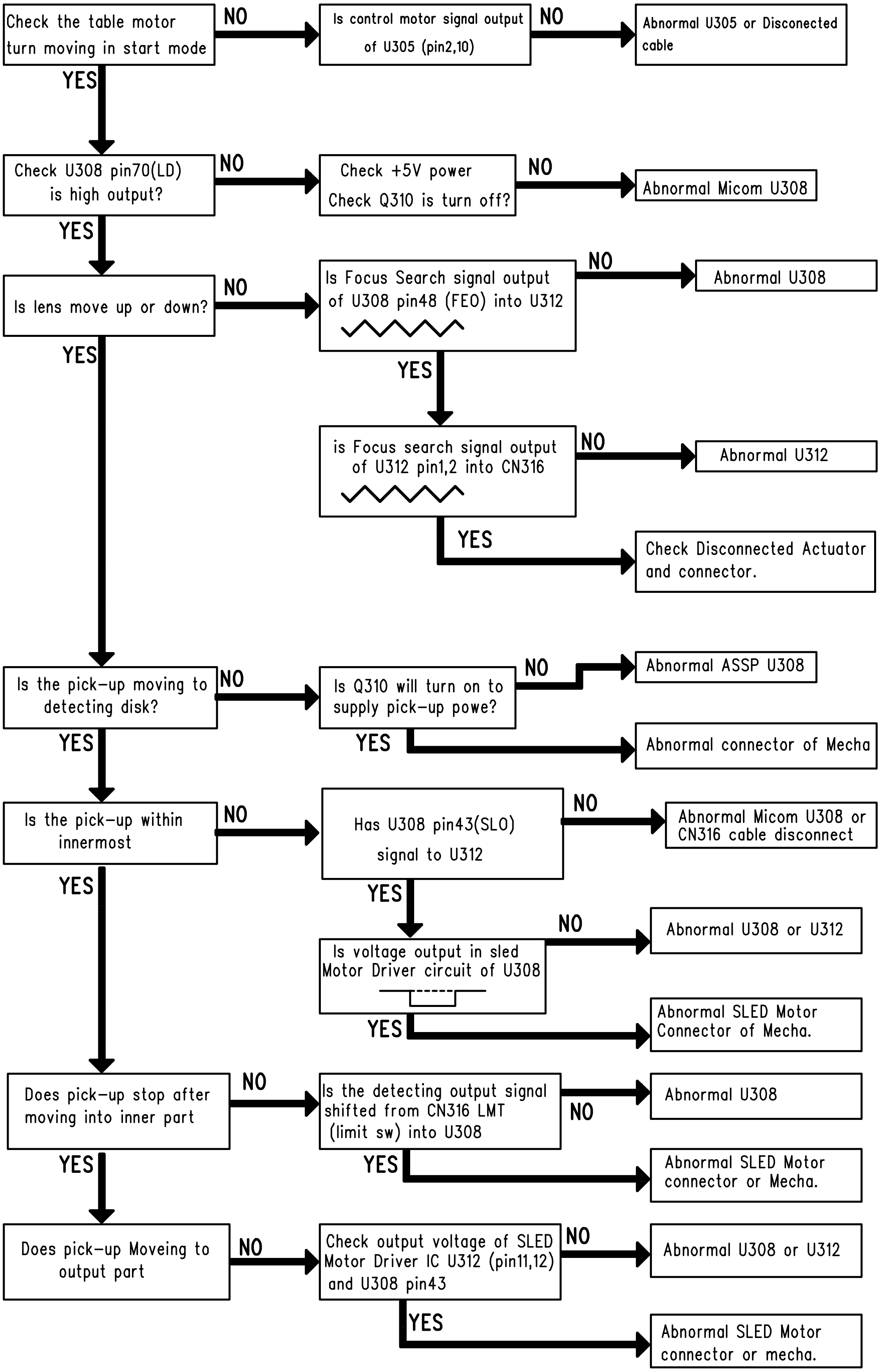


Remark: (A) is next page

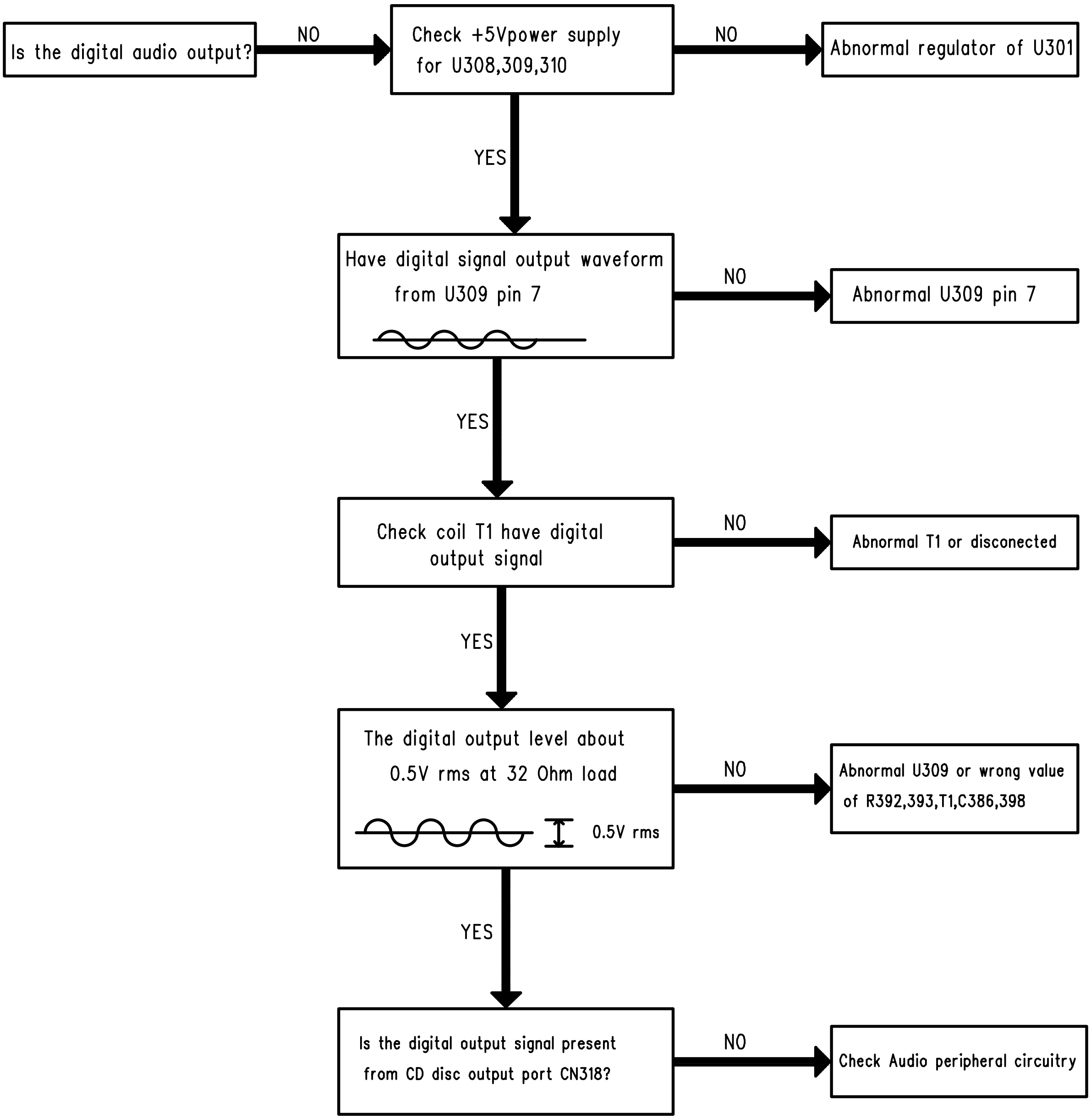
A: When Laser is NOT Operation



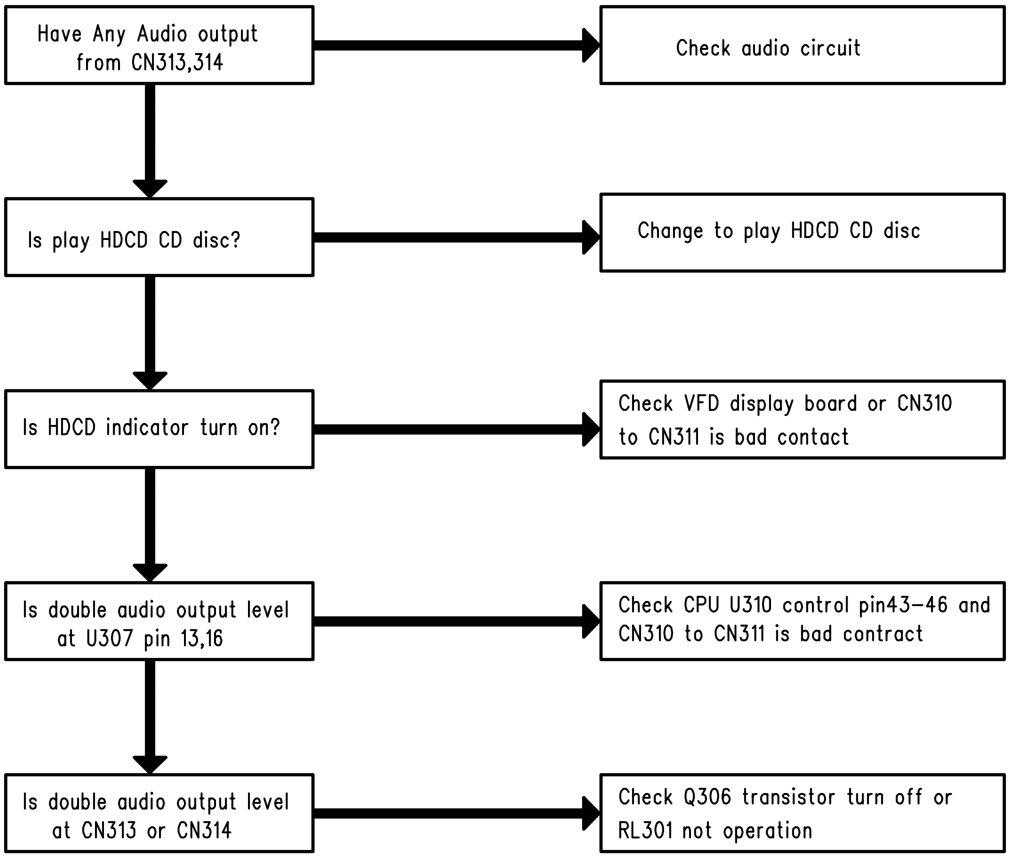
A: When Laser is NOT Operation



3) Check Digital Audio Circuit



4) Check HCDC Circuit



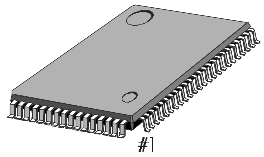
KB9223

RF AMP & SERVO SIGNAL PROCESSOR

OVERVIEW

The KB9223 is a 1-chip BICMOS integrated circuit to perform the function of RF amp and servo signal processor for compact disc player applications.It consist of blocks for RF signal processing ,focus, tracking, sled and spindle servo.Also this IC has adjustment free function and embedded opamp for audio post filter.

80-QFP-1420C



FEATURES

- RF amplifier & RF equalizer
- Focus error amplifier & servo control
- Tracking error amplifier & servo control
- Mirror & defect detector circuit
- Focus OK detector circuit
- APC(Auto Laser Power Control) circuit for constant laser power
- FE bias & focus servo offset adjustment free
- EF balance & tracking error gain adjustment free
- Embedded audio post filter
- The circuit for Interruption countermeasure
- Double speed play available
- Operating voltage range

  KB9223 : 5V

  KB9223-L : 3.4V

ORDERING INFORMATION

Device	Package	Tempe. Range
KB9223	80-QFP-1420C	-20°C ~ +70°C
KB9223-L		

APPLICATIONS

- CD Player
- Video-CD

RELATED PRODUCT

- KS9286 Data Processor
- KS9284 Data Processor
- KA9258D/KA9259D Motor Driver

SAMSUNG ELECTRONICS

M/M-97-P006

1997. 10. 17

KB9223

BLOCK DIAGRAM

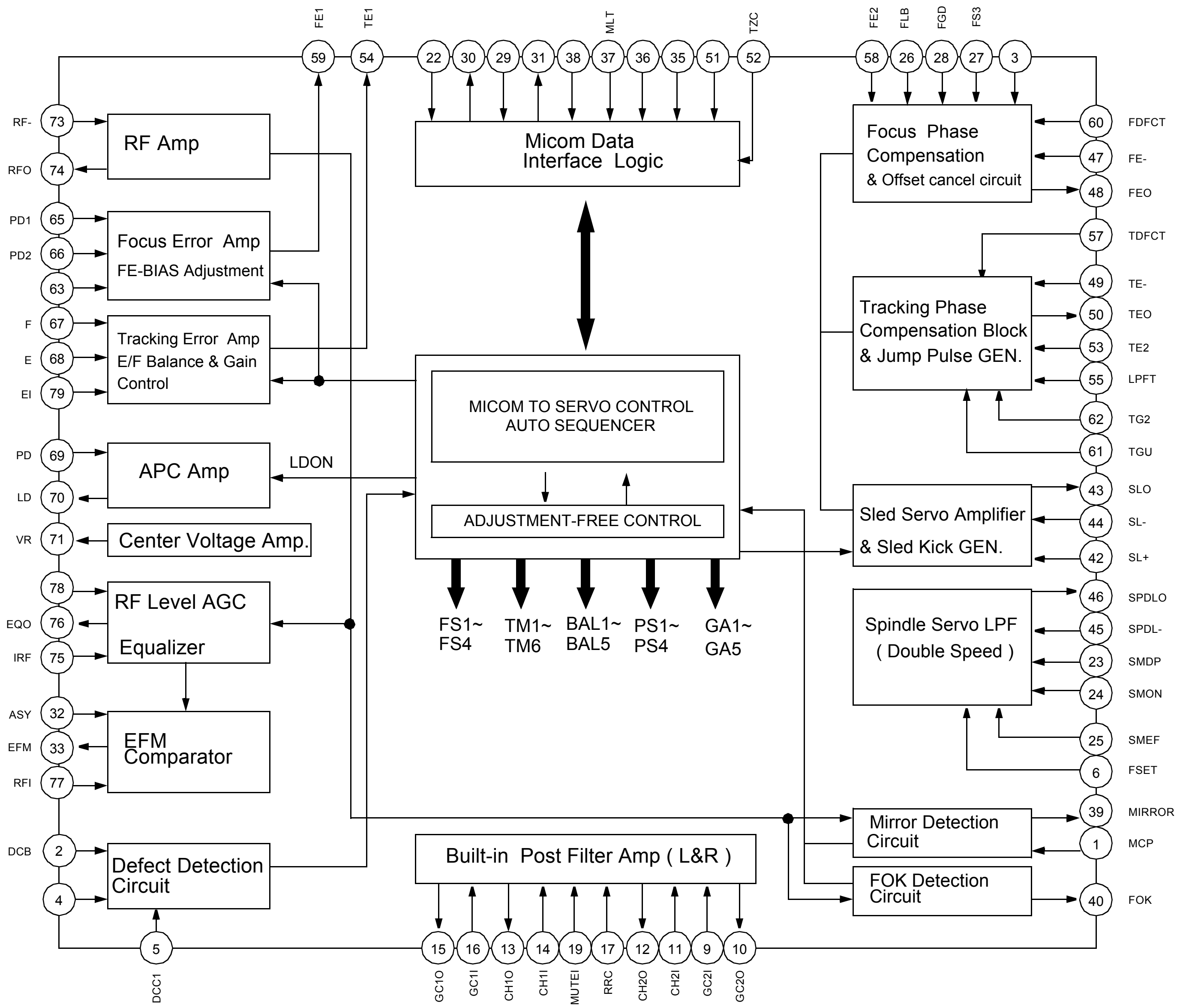


Figure 1. Block diagram

PIN CONFIGURATION

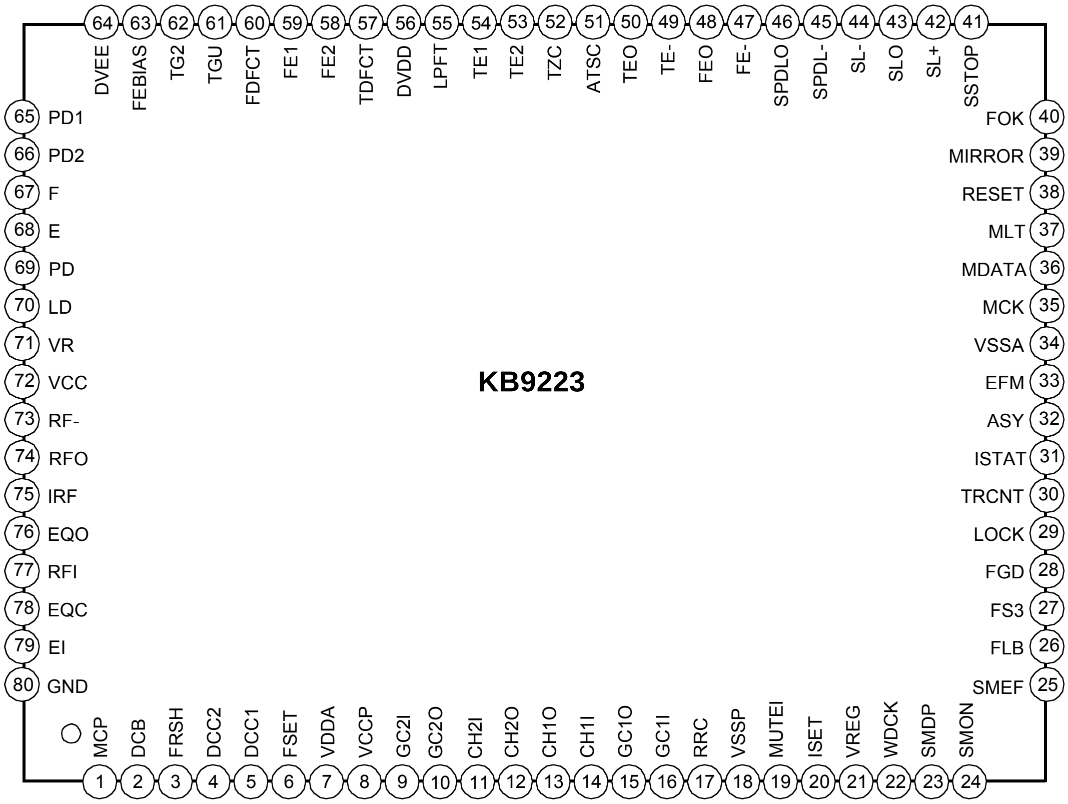


Figure 2. Pin configuration

PIN DESCRIPTION

Table 1. PIN DESCRIPTION

Pin No.	Symbol	Description
1	MCP	Capacitor connection pin for mirror hold
2	DCB	Capacitor connection pin for defect Bottom hold
3	FRSH	Capacitor connection pin for time constant to generate focus search waveform
4	DCC2	The input pin through capacitor of defect bottom hold output
5	DCC1	The output pin of defect bottom hold
6	FSET	The peak frequency setting pin for focus,tracking servo and cut off frequency of CLV LPF
7	VDDA	Analog VCC for servo part
8	VCCP	VCC for post filter
9	GC2I	Amplifier negative input pin for gain and low pass filtering of DAC output CH2
10	GC2O	Amplifier output pin for gain and low pass filtering of DAC output CH2
11	CH2I	The input pin for post filter channel2
12	CH2O	The output pin for post filter channel2
13	CH1O	The output pin for post filter channel1
14	CH1I	The input pin for post filter channel1
15	GC1O	Amplifier output pin for gain and low pass filtering of DAC output CH1
16	GC1I	Amplifier negative input pin for gain and low pass filtering of DAC output CH1
17	RRC	The pin for noise reduction of post filter bias
18	VSSP	VSS for post filter
19	MUTEI	The input pin for post filter muting control
20	ISET	The input pin for current setting of focus search,track jump and sled kick voltage
21	VREG	The output pin of regulator
22	WDCK	The clock input pin for auto sequence
23	SMDP	The input pin of CLV control output pin SMDP of DSP
24	SMON	The input pin for spindle servo ON through SMON of DSP
25	SMEF	The input pin of provide for an external LPF time constant
26	FLB	Capacitor connection pin to perform rising low bandwidth of focus loop

Table 1. PIN DESCRIPTION (Continued)

Pin No.	Symbol	Description
27	FS3	The pin for high frequency gain change of focus loop with internal FS3 switch
28	FGD	Reducing high frequency gain with capacitor between FS3 pin
29	LOCK	Sled runaway prevention pin
30	TRCNT	Track count output pin
31	ISTAT	Internal status output pin
32	ASY	The input pin for asymmetry control
33	EFM	EFM comparator output pin
34	VSSA	Analog VSS for servo part
35	MCK	Micom clock input pin
36	MDATA	Micom data input pin
37	MLT	Micom data latch input pin
38	RESET	Reset input pin
39	MIRROR	The mirror output for test
40	FOK	The output pin of focus OK comparator
61	TGU	The capacitor connection pin for high frequency tracking gain switch
62	TG2	The pin for high frequency gain change of tracking servo loop with internal TG2 switch
63	FEBIAS	Focus error bias voltage control pin
64	DVEE	The DVEE pin for logic circuit
65	PD1	The negative input pin of RF I/V amplifier1(A+C signal)
66	PD2	The negative input pin of RF I/V amplifier2(B+D signal)
67	F	The negative input pin of F I/V amplifier (F signal)
68	E	The negative input pin of E I/V amplifier(E signal)
69	PD	The input pin for APC
70	LD	The output pin for APC
71	VR	The output pin of (AVEE+AVCC)/2 voltage
72	VCC	VCC for RF part
73	RF-	RF summing amplifier inverting input pin
74	RFO	RF summing amplifier output pin

Table 1. PIN DESCRIPTION (Continued)

Pin No.	Symbol	Description
75	IRF	The input pin for AGC
76	EQO	The output pin for AGC
77	RFI	Tne input pin for EFM comparision
78	EQC	The capacitor connection pin for AGC
79	EI	Feedback input pin of E I/V amplifier for EF Balance control
80	GND	GND for RF part

ABSOLUTE MAXIMUM RATINGS

Table 2. Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Supply Voltage	Vmax	6	V
Power Dissipation	PD	200	mW
Operating Temperature	T_{OPR}	-20 ~ +70	^oC
Storage temperature	T_{STG}	-55 ~ +150	^oC

ELECTRICAL CHARACTERISTICS

Table 3. Electrical Characteristics
(Ta=25°C, VDD = DVDD = VCC = +5V, VSS = DVSS = GND = VSSP = 0V)

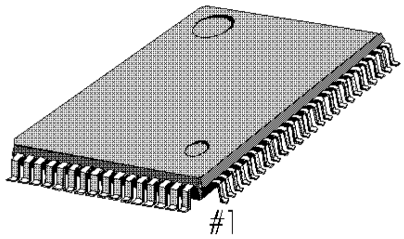
Characteristic	Symbol	Test Conditions	Output	Min	Typ	Max	Unit
Supply Current High	ICCHI	VCC=6V,No load	-	20	40	60	mA
Supply Current Typ	ICCTY	VCC=5V,No Load	-	12	30	48	mA
Supply Current Low	ICCLO	VCC=3.4V,No Load	-	10	25	40	mA
RF Amp Offset Voltage	Vrfo	input open	pin 74	-80	0	+80	mV
RF Amp Voltage Gain	Grf	SG3 f=10KHz,40mVp-p,sine	pin 74	25.1	28.1	31.1	dB
RF THD	Grfmd	SG3 f=1KHz,40mVp-p,sine	pin 74	-	-	5	%
RF Amp Max. Output Voltage	Vrfpp1	SG3 DC 2.7V	pin 74	3.8	-	-	V
RF Amp Min. Output Voltage	Vrfpp2	SG3 DC 2.3V	pin 74	-	-	1.2	V
Focus Error Amp Offset Voltage	Vfeo1	input open	pin 59	-450	-250	-50	mV
Focus Error Amp Auto Offset Voltage	Vfeo2	WDCH=88.2KHz Pulse ,$841	pin 59	-35	0	35	mV
Focus Error Amp PD1 Voltage Gain	Gfe1	SG3 f=10KHz,32mVp-p,sine	pin 59	27	30	33	dB
Focus Error Amp PD2 Voltage Gain	Gfe2	SG3 f=10KHz,32mVp-p,sine	pin 59	27	30	33	dB
Focus Error Amp Voltage Difference	GfeΔ	ΔGfe1-ΔGfe1	pin 59	-3	0	+3	dB
Focus Error Amp Max. Output Voltage	Gfepp1	SG3 DC 2.7V	pin 59	4.4	-	-	V
Focus Error Amp Min. Output Voltage	Gfepp2	SG3 DC2.3V	pin 59	-	-	0.6	V
AGC Max Gain	Gagc	SG4 f=500KHz,20mVp-p,sine	pin 76	16	19	22	dB
AGC EQ Gain	Geq	Gain Difference of Gagc at f=1.5MHz	pin 76	0	1	2	dB
AGC Gain2	Gagc2	SG4 f=500KHz,0.5Vp-p,sine	pin 76	3.5	6	9	dB
AGC Cpmpress Ratio	Cagc	Gain Difference of Gagc2 at 0.1Vp-p	pin 76	0	2.5	5	dB
AGC Frequency	Fagc	Gain Difference SG4 f=1.5MHz,0.1Vp-p,sine and f=500KHz,0.1Vp-p,sine	pin 76	-1.5	0	2.5	dB

KS9284

INTRODUCTION

The KS9284 is a CMOS integrated circuit designed for the digital audio signal processor.
It is a monolithic IC that builts in 16K SRAM and DPLL.
It is similar to KS9284 IC but has advanced error correction ability.

80-QFP-1420C



FEATURES

- EFM data demodulation
- Built-in frame sync detection, protection and insertion circuit
- C1:2 - Error correction, C2:4 - Erasure correction
- Interpolation
- Subcode data serial output
- CLV servo controller
- Tracking counter
- Micom interface
- Built-in 16K SRAM
- Digital audio output (TX)
- Built-In digital PLL and analog PLL
- Double speed function
- Single power supply: +5V

ORDERING INFORMATION

Device	Package	Operating Temperature
KS9284	80-QFP-1420C	- 20°C~ + 75°C

KS9284

BLOCK DIAGRAM

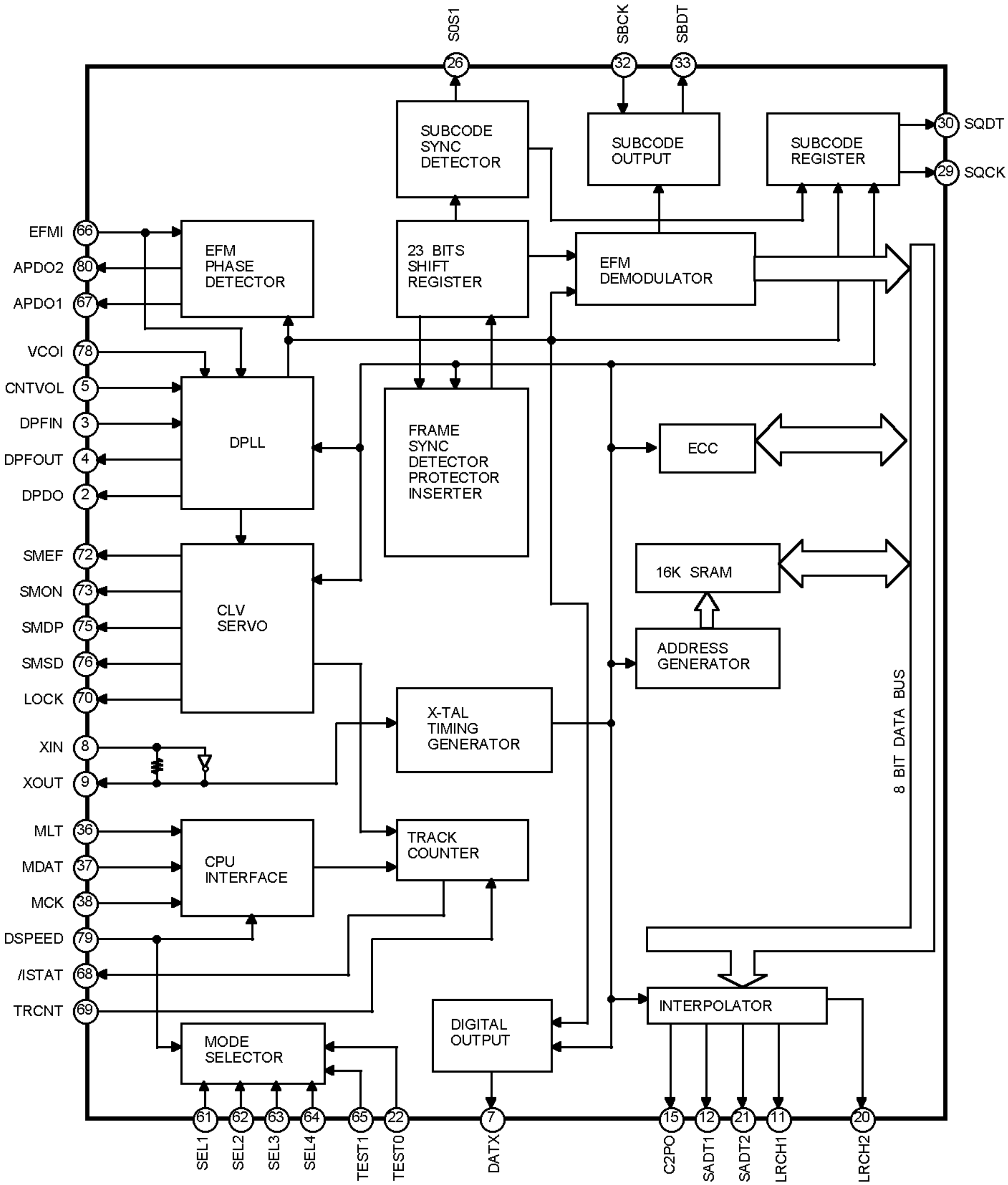


Fig. 1

KS9284

PIN CONFIGURATION

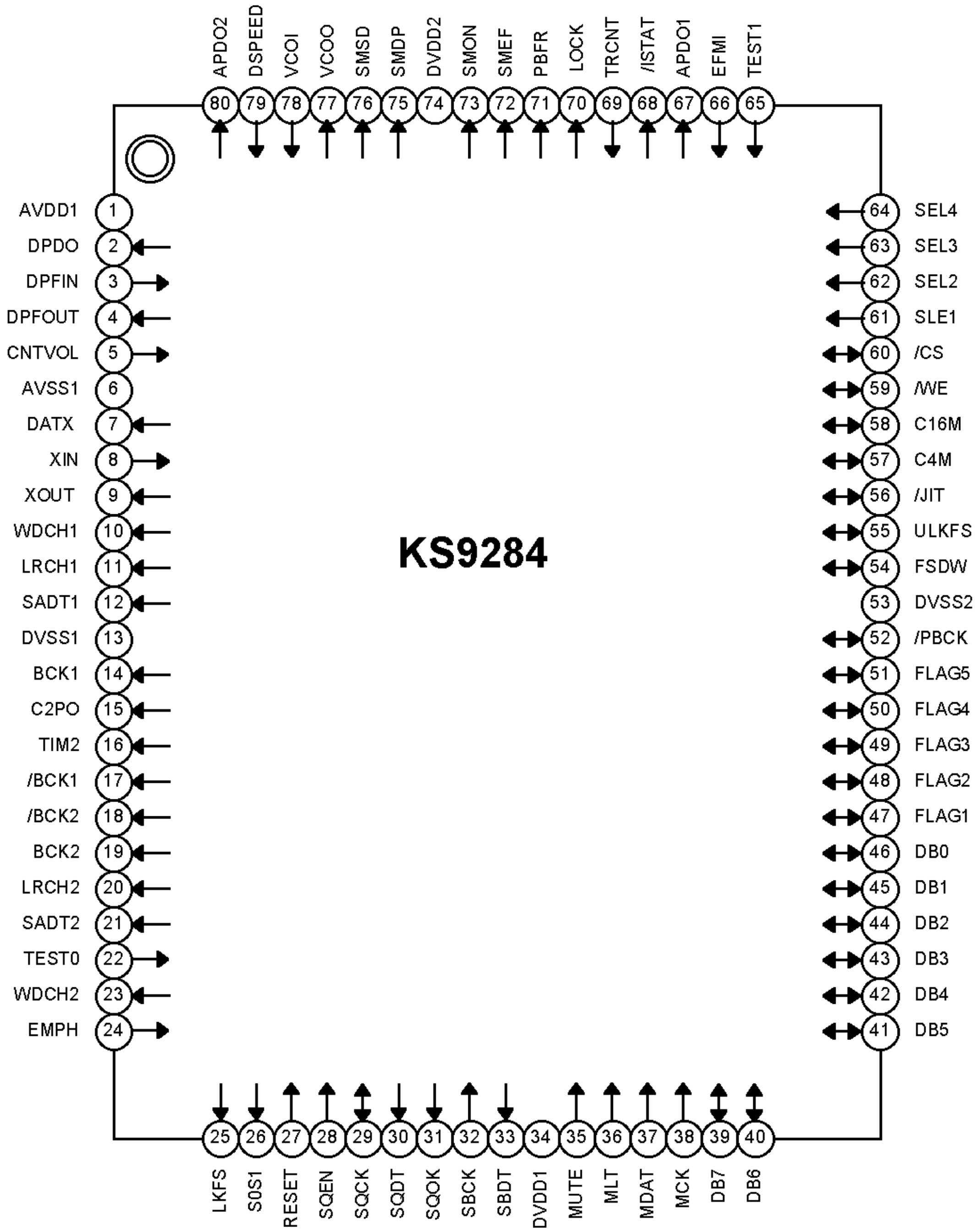


Fig. 2

PIN DESCRIPTION

Pin No.	Symbol	I/O	Description
1	$AV_{DD}1$	-	Analog supply voltage 1
2	DPDO	O	Charge pump output for master PLL
3	DPFIN	I	Filter input for master PLL
4	DPFOUT	O	Filter output for master PLL
5	CNTVOL	I	VCO control voltage for master PLL
6	$AV_{SS}1$	-	Analog ground 1
7	DATX	O	Digital audio output
8	XIN	I	X-tal oscillator input (16.9344MHz / 33.8688MHz)
9	XOUT	O	X-tal oscillator output
10	WDCH1	O	Word clock of 48 bits/slot
11	LRCH1	O	Channel clock of 48 bits/slot
12	SADT1	O	Serial audio data output with 48 bits/slot
13	DV_{SS1}	-	Digital ground 1
14	BCK1	O	Serial audio data bit clock for 48 bits/slot
15	C2PO	O	C2 pointer for serial audio data
16	TIM2	O	Normal or double speed control output pin
17	/BCK1	O	Inverted clock of BCK1
18	/BCK2	O	Inverted clock of BCK2
19	BCK2	O	Serial audio data bit clock for 64 bits/slot
20	LRCH2	O	Channel clock for 64 bits/slot
21	SADT2	O	Serial audio data output with 64 bits/slot
22	TEST0	I	Test input pin (“L”: normal, “H”: test)
23	WDCH2	O	Word clock of 64 bit/slot
24	EMPH	O	Emphasis/Non-emphasis output (“H” : Emphasis)
25	LKFS	O	The lock status output of frame sync
26	S0S1	O	Output of subcode sync signal (S0 + S1)
27	RESET	I	System reset at “L”
28	SQEN	I	SQCK control input (“L”: internal clock, “H”: external clock)
29	SQCK	I/O	Subcode-Q data bit clock
30	SQDT	O	Subcode-Q data serial output

PIN DESCRIPTION (continued)

Pin No.	Symbol	I/O	Description
31	SQOK	O	The CRC check result signal output of subcode-Q
32	SBCK	I	Subcode data bit clock
33	SBDT	O	Subcode serial data output
34	$DV_{DD}1$	-	Digital supply voltage 1
35	MUTE	I	Mute control input (“H”: Mute ON)
36	MLT	I	Latch signal input from micom
37	MDAT	I	Serial data input from micom
38	MCK	I	Serial data transfering clock input from micom
39	DB7	I/O	Data port 7 for external SRAM (MSB)
40	DB6	I/O	Data port 6 for external SRAM
41	DB5	I/O	Data port 5 for external SRAM
42	DB4	I/O	Data port 4 for external SRAM
43	DB3	I/O	Data port 3 for external SRAM
44	DB2	I/O	Data port 2 for external SRAM
45	DB1	I/O	Data port 1 for external SRAM
46	DB0	I/O	Data port 0 for external SRAM (LSB)
47	FLAG1	I/O	Monitoring output for C1 error correction (RA0)
48	FLAG2	I/O	Monitoring output for C1 error correction (RA1)
49	FLAG3	I/O	Monitoring output for C2 error correction (RA2)
50	FLAG4	I/O	Monitoring output for C2 error correction (RA3)
51	FLAG5	I/O	C2 decoder flag (“H”: when the processing C2 code is impossible correction status /RA4)
52	/PBCK	I/O	VCOI/2 clock (4.3218/8.6436MHz) ; when locked in with EFMI (RA5)
53	$DV_{SS}2$	-	Digital ground 2
54	FSDW	I/O	Unprotected frame sync (RA6)
55	ULKFS	I/O	Frame sync protection status (RA7)
56	/JIT	I/O	RAM overflow and underflow status (RA8)
57	C4M	I/O	4.2336MHz clock output (RA9)
58	C16M	I/O	16.9344MHz clock output (RA10)
59	/WE	I/O	Write enable output to external SRAM
60	/ CS	I/O	Chip select output to external SRAM

PIN DESCRIPTION (continued)

Pin No.	Symbol	I/O	Description
61	SEL1	I	X-tal selection terminal (“L”:16.9344MHz; “H” : 33.8688MHz)
62	SEL2	I	DPLL selection terminal (“L”: DPLL, “H” : APLL)
63	SEL3	I	CD-ROM selection terminal (“L”: CDP, “H” : CD-ROM)
64	SEL4	I	SRAM selection terminal (“L”: internal SRAM, “H” : external SRAM)
65	TEST1	I	Test terminal (“L”: normal, “H”: test)
66	EFMI	I	EFM data input
67	APDO1	O	Charge pump output for analog PLL
68	/ISTAT	O	The internal status output
69	TRCNT	I	Tracking clock input signal
70	LOCK	O	Output signal of LKFS conditions sampled PBFR/16 (If LKFS is “H”, lock is “H”. If the LKFS is sampled “L” at least 8 times by PBFR/16, lock is “L”)
71	PBFR	O	Write frame clock (Lock : 7.35KHz)
72	SMEF	O	LPF time constant control of the spindle servo error signal
73	SMON	O	ON/OFF control signal for spindle servo
74	$DV_{DD}2$	-	Digital supply vlotage 2
75	SMDP	O	Spindle motor driving output (rough control in the speed mode, phase control in the phase mode
76	SMSD	O	Spindle motor (Velocity control in the phase mode)
77	VCOO	O	VCO output
78	VCOI	I	VCO inut (when the state is lock by means of PBFR, it is 8.6436MHz)
79	DSPEED	I	Double speed mode control (“H”: normal speed, “L”: 2-times speed)
80	APDO2	O	Analog PLL charge pump output for double speed mode

(NOTE)
1. PBFR: 7.35KHz Write frame clock produced by data which being reproduced.
2. /PBCK : Channel bit clock of data which being reproduced.
3. /JIT : Display signal of either RAM overflow or underflow for ± 4 frame jitter margin.

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{DD}	-0.3 ~ 7.0	V
Input Voltage	V_I	-0.3 ~ 7.0	V
Output Voltage	V_O	-0.3 ~ 7.0	V
Operating Temperature	T_{OPR}	-20 ~ 75	°C
Storage Temperature	T_{STG}	-40 ~ 125	°C

ELECTRICAL CHARACTERISTICS

1. DC Characteristics

(V_{DD} = 5V, V_{SS} = 0V, Ta = 25°C, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
"H" Input Voltage1	$V_{IH(1)}$	(Note 1)	0.7V_{DD}	-	-	V
"L" Input Voltage1	$V_{IL(1)}$	(Note 1)	-	-	0.3V_{DD}	V
"H" Input Voltage2	$V_{IH(2)}$	(Note 2)	0.8V_{DD}	-	-	V
"L" Input Voltage2	$V_{IL(2)}$	(Note 2)	-	-	0.2V_{DD}	V
"H" Outut Voltage1	$V_{OH(1)}$	I_{OH} = -1mA(Note 3)	V_{DD} - 0.5	-	V_{DD}	V
"L" Output Voltage1	$V_{OL(1)}$	I_{OL} = 1mA(Note 3)	0	-	0.4	V
"H" Outut Voltage2	$V_{OH(2)}$	I_{OH} = -1mA(Note 4)	V_{DD} - 0.5	-	V_{DD}	V
"L" Output Voltage2	$V_{OL(2)}$	I_{OL} = 1mA(Note 4)	0	-	0.4	V
"H" Outut Voltage3	$V_{OH(3)}$	I_{OH} = -1mA(Note 5)	V_{DD} - 0.5	-	V_{DD}	V
"L" Output Voltage3	$V_{OL(3)}$	I_{OL} = 1mA(Note 5)	0	-	0.4	V
Input Leak Current1	I_{LKG1}	V_I = 0 ~ V_{DD}(Note 6)	-5	-	+ 5	μA
Input Leak Current2	I_{LKG2}	V_O = 0 ~ V_{DD}(Note 7)	-10	-	+10	μA
Tri - State Output Leak Current	$I_{O(LKG)}$	V_I = 0 ~ V_{DD}(Note 8)	-5	-	+ 5	μA

(Note 1) Input Voltage1: All input pins
(Note 2) Input Voltage2: All BIDIR pins
(Note 3) Output Voltage1: All output pins
(Note 4) Output Voltage2: All BIDIR pins
(Note 5) Output Voltage 3: All Tri - state output pins
(Note 6) Input Leak Current 1: All input pins except for XIN, VCOI
(Note 7) Input Leak Current 2: XIN, VCOI
(Note 8) Output Leak Current : SMEF, SMDP, SMSD, APDO1, APDO2, DPDO

2. AC Characteristics

A. XIN, VCOI (When the pulse is inputted to)
(V_{DD} = 5V, V_{SS} = 0V, Ta = 25°C, unless otherwise specified)

Characteristic	Symbol	Min	Typ	Max	Unit
"H" Level Pulse Width	t_{wH}	13	-	-	ns
"L" Level Pulse Width	t_{wL}	13	-	-	ns
Pulse Frequency	t_{CK}	26	-	-	ns
Input "H" Level	V_{IH}	V_{DD} - 1.0	-	-	V
Input "L" Level	V_{IL}	-	-	0.8	V
Rising & Falling Time	t_R, t_F	-	-	8	ns

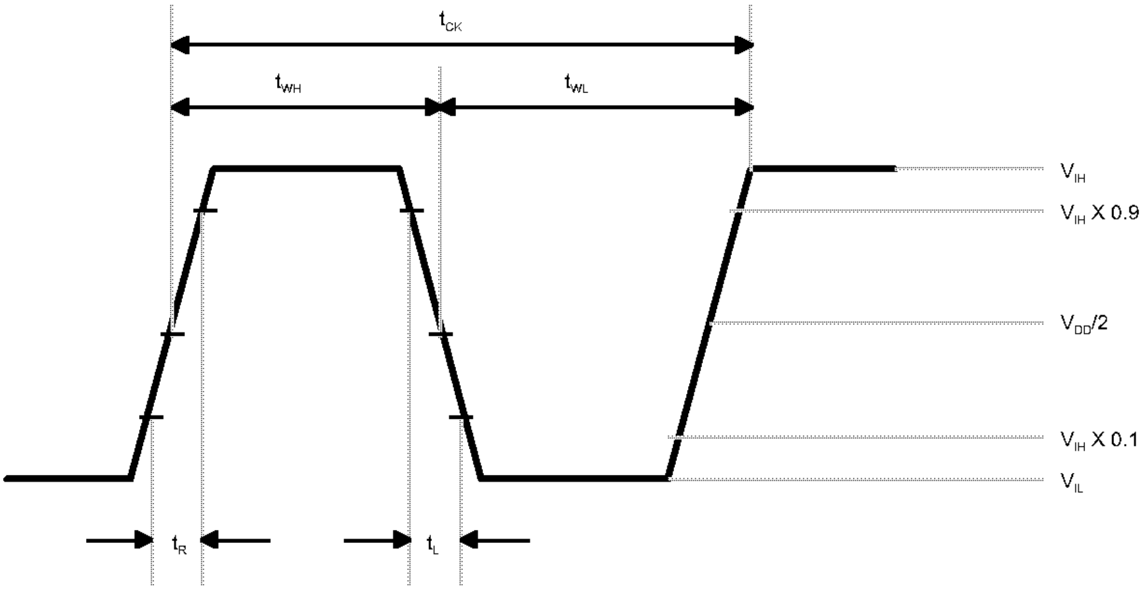
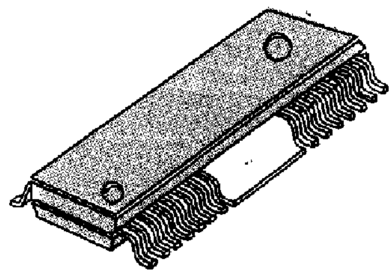


Fig. 3

4-CH MOTOR DRIVER

The KA9258D is a monolithic integrated circuit, and suitable for 4-CH motor driver which drives tracking actuator,focus actuator, sled motor and loading motor of CD/CD-ROM/DVD system, and can also drive spindle motor of CD system.

28-SSOPH-375



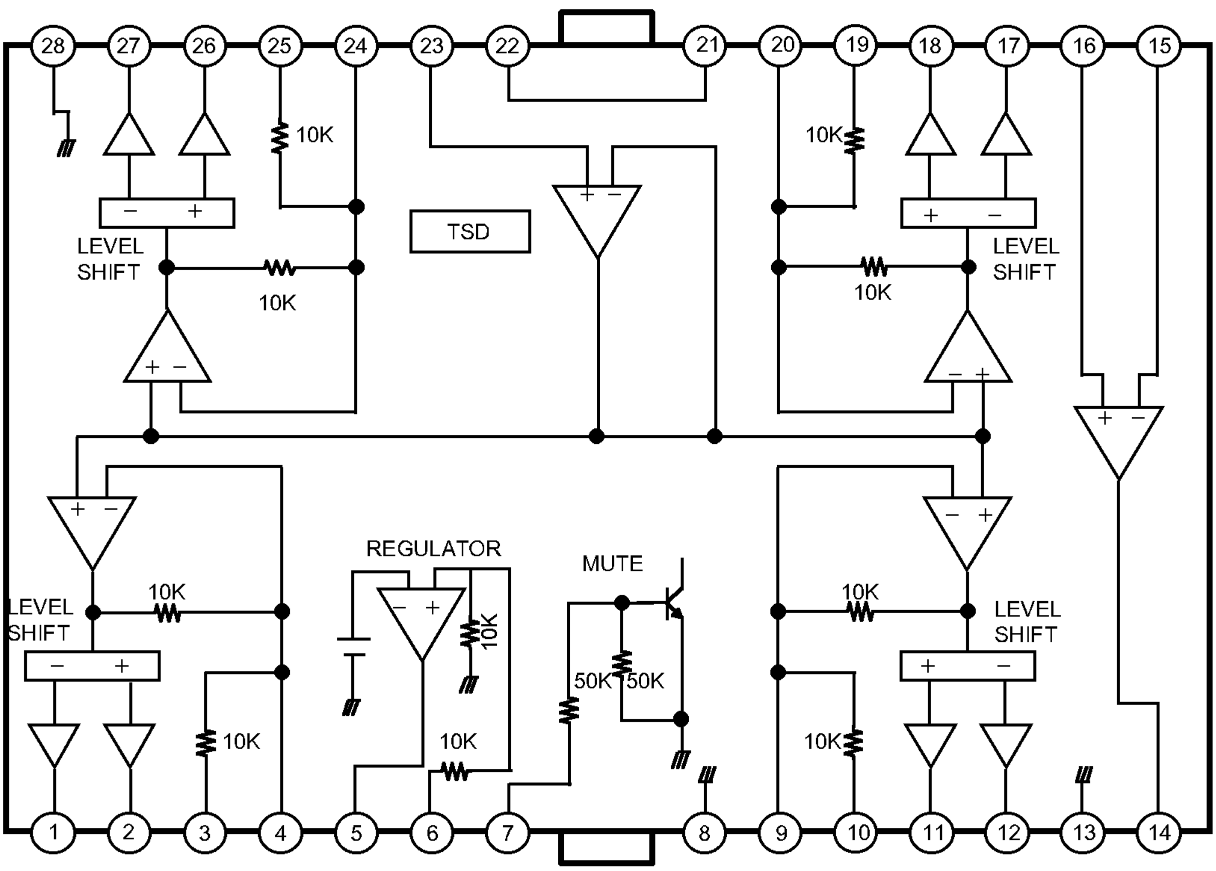
FEATURES

- 1-phase, full-wave, linear DC motor driver
- Output gain adjustable
- Built in OP-Amp
- Built in Mute function
- Built in Level shift circuit
- Built in Thermal shutdown function

ORDERING INFORMATION

Device	Package	Operating Temperature
KA9258D	28-SSOPH-375	− 20℃ ~ + 75℃

BLOCK DIAGRAM



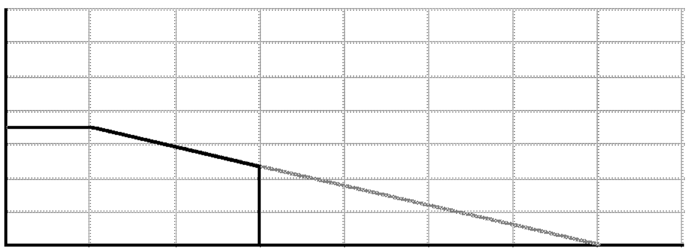
PIN DESCRIPTION

Pin No.	Symbol	I/O	Description
1	DO1.1	O	Drive Output
2	DO1.2	O	Dirve Output
3	DI1.1	I	Drive Input
4	DI1.2	I	Drive Input
5	REG		Regulator
6	REO	O	Regulator Output
7	MUTE	I	Mute
8	GND1	-	Ground
9	DI2.1	I	Drive Input
10	DI2.2	I	Drive Input
11	DO2.1	O	Drive Output
12	DO2.2	O	Dirve Output
13	GND2	-	Ground
14	OPOUT	O	Opamp Output
15	OPIN (-)	I	Opamp Input (-)
16	OPIN (+)	I	Opamp Input (+)
17	DO3.1	O	Drive Output
18	DO3.2	O	Drive Output
19	DI3.1	I	Drive Input
20	DI3.2	I	Drive Input
21	VCC1	-	Supply Voltage
22	VCC2	-	Supply Voltage
23	VREF	I	2.5V Bias Voltage
24	DI4.1	I	Drive Input
25	DI4.2	I	Drive Input
26	DO4.1	O	Drive Output
27	DO4.2	O	Drive Output
28	GND3	-	Ground

ABSOLUTE MAXIMUM RATING (Ta=25℃)

Characteristics	Symbol	Value	Unit
Supply Voltage	V_{CC}	18	V
Power Dissipation	P_D	@1.7	W
Operating Temperature	T_{OPR}	-25~+75	℃
Storage Temperature	T_{STG}	-55~+150	℃

@ 1. When mounted on 50mmx50mmx1mm PCB (Phenolic resin material).
2. Power dissipation reduces 13.6mW/℃ for using above Ta=25℃.
3. Do not exceed Pd and SOA.



ELECTRICAL CHARACTERISTICS (Ta=25℃, V_{CC}=8V, Unless Otherwise Specified)

A. REGULATOR PART

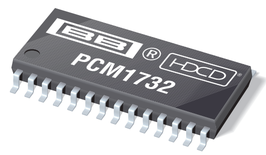
Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Regulator Output Voltage	V_{REG}	I_L=100mA	4.75	5	5.25	V
Load Regulation	$\triangle V_{RL}$	I_L=0mA to 200mA	-40.0	0	10.0	mV
Line Regulation	$\triangle V_{CC}$	I_L=200mA, V_{CC}=6 to 9V	-10.0	0	20.0	mV

B. DRIVE PART

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Quiescent Circuit Current	I_{CCQ}	V_I=0	5.5	9.5	13.5	mA
Input Bias Current	I_{BOP}	V_I=0			300	nA
Input Offset Voltage	V_{OFOP}		-5.0	0	5.0	mV
Output Offset Voltage	V_{OO}		-30	0	30	
Maximum Sink Current	I_{SINK}	R_L=4Ω, V_{CC}	0.5	0.8		A
Maximum Source Current	I_{SOUCE}	R_L=4Ω, GND	0.5	0.8		
Maximum Output Voltage	V_{MA}	V_I=2V_{RMS}, 1KHz	2.5	3.0		V
Closed Loop Voltage Gain	A_{VF}	V_I=0.1V_{RMS}, 1KHz	4.5	6.5	7.5	dB
Ripple Rejection Ratio	R_R	V_I= -20dB, 120Hz	60.0	80.0		
Slew Rate	S_R	100Hz, Squarewave	1.0	2.0		V/us

BURR - BROWN®

HDCD®



For most current data sheet and other product information, visit www.burr-brown.com

PCM1732

SoundPlus™ 24-Bit, 96kHz, Stereo Audio DIGITAL-TO-ANALOG CONVERTER With HDCD® Decoder

FEATURES

- ENHANCED MULTI-LEVEL ΔΣ DAC
- INPUT AUDIO DATA WORD: 16-, 20-, 24-Bit
- SAMPLING FREQUENCY (f_S): 16kHz - 96kHz
- SYSTEM CLOCK: 256, 384, 512, 768f_S
- HIGH PERFORMANCE:
  THD+N: –96dB
  Dynamic Range: 104dB
  SNR: 104dB
- AUDIO OUTPUT LEVEL: 0.57 x V_{CC} (Vp-p)
- 8x OVERSAMPLING DIGITAL FILTER WITH HDCD DECODER:
  Stopband Attenuation: –120dB
  Passband Ripple: ±0.00001dB
  HDCD Filter Optimized for 44.1kHz to 48kHz and 88.2kHz to 96kHz
- MULTI-FUNCTIONS:
  Digital De-emphasis
  Soft Mute
  Digital Attenuation
  Zero Detect
  Digital Gain Scaling
  Reversible Output Phase
- +5V SINGLE-SUPPLY OPERATION
- SMALL SO-28 PACKAGE

NOTE: An HDCD license from Pacific Microsonics, Inc. is required to purchase the PCM1732.

HDCD® is a registered trademark of Pacific Microsonics, Inc.

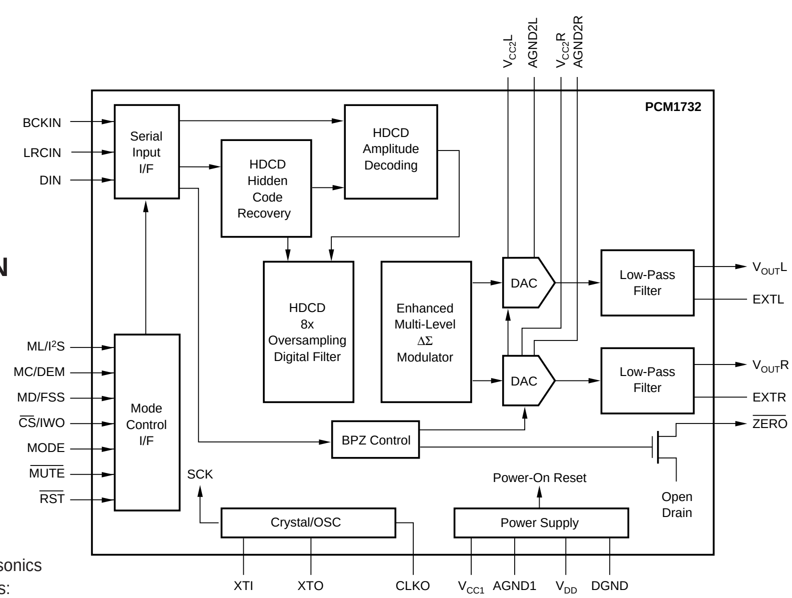
HDCD® technology is provided under license from Pacific Microsonics Inc. The PCM1732's design is covered by the following patents:
In the USA: 45,479,168, 5,638,074, 5,640,161, 5,808,574, 5,838,274 5,854,600, 5,864,311, 5,872,531.
In Australia: 669,114.
Other patents pending.

DESCRIPTION

The PCM1732 is designed for mid- to high-grade digital audio applications which achieve 96kHz sampling rates with 24-bit audio data, such as High Definition Compatible Digital (HDCD) CD players, DVD players, mini-disc players and AV receivers.

PCM1732 uses a newly-developed "enhanced, multi-level delta-sigma modulator" architecture that improves audio dynamic performance and reduces jitter sensitivity.

The internal digital filter operates at 8x oversampling at a 96kHz sampling rate, with –120dB stopband attenuation.



International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111
Twx: 910-952-1111 • Internet: http://www.burr-brown.com/ • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS

24-Bit Data Performance

All specifications at +25°C, $+V_{CC} = +V_{DD} = +5V$, f_S = 44.1kHz, and SYSCLK = $384f_S$, unless otherwise noted.

PARAMETER	CONDITIONS	PCM1732 MIN	PCM1732 TYP	PCM1732 MAX	UNITS
RESOLUTION		24		Bits	
DATA FORMAT					
Audio Data Interface Format			Standard/I²S		
Data Bit Length			16/20/24 Selectable		
Audio Data Format			MSB-First, Binary Two's Complement		
Sampling Frequency (f_S)		16		96	kHz
System Clock Frequency(1)			$256/384/512/768f_S$		
System Clock Duty Cycle		40		60	%
DIGITAL INPUT/OUTPUT LOGIC LEVEL					
Input Logic Level (except XTI): V_{IH}		2.0			V
V_{IL}				0.8	V
Output Logic Level (CLKO): V_{OH}	I_{OH} = 2mA	4.5			V
V_{OL}	I_{OL} = 4mA			0.5	V
CLKO PERFORMANCE(2)					
Output Rise Time	20 ~ 80% V_{DD}, 10pF		5.5		ns
Output Fall Time	80 ~ 20% V_{DD}, 10pF		4		ns
Output Duty Cycle	10pF Load		30		%
DYNAMIC PERFORMANCE(3, 4)					
THD+N V_O = 0dB	f_S = 44.1kHz		–96	–90	dB
	f_S = 96kHz		–94		dB
V_O = –60dB	f_S = 44.1kHz		–42		dB
Dynamic Range	f_S = 44.1kHz, EIAJ A-weighted	98	104		dB
	f_S = 96kHz, A-weighted		103		dB
Signal-to-Noise Ratio(5)	f_S = 44.1kHz, EIAJ A-weighted	98	104		dB
	f_S = 96kHz, A-weighted		103		dB
Channel Separation	f_S = 44.1kHz	96	104		dB
	f_S = 96kHz		101		dB
DC ACCURACY					
Gain Error			±1.0	±3.0	% of FSR
Gain Mismatch Channel-to-Channel			±1.0	±3.0	% of FSR
Bipolar Zero Error	$V_O = 0.5V_{CC}$ at Bipolar Zero		±30	±60	mV
ANALOG OUTPUT					
Output Voltage(6)	Full Scale (0dB)		0.57 V_{CC}		Vp-p
Center Voltage			0.5 V_{CC}		V
Load Impedance	AC Load	5			kΩ
DIGITAL FILTER PERFORMANCE					
Filter Characteristics 1					
(f_S = 44.1kHz/48kHz optimal)					
Passband	±0.002dB			$0.471f_S$	
	–3dB			$0.487f_S$	
Stopband		$0.515f_S$			
Passband Ripple	< $0.453f_S$			±0.0001	dB
Stopband Attenuation	Stopband = $0.515f_S$	–109			dB
	Stopband = $0.520f_S$	–123			dB
Delay Time			$81/f_S$		sec
Filter Characteristics 2					
(f_S = 88.2kHz/96kHz optimal)					
Passband	±0.005dB			$0.395f_S$	
	–3dB			$0.441f_S$	
Stopband		$0.538f_S$			
Passband Ripple	< $0.341f_S$			±0.0001	dB
Stopband Attenuation	Stopband = $0.538f_S$	–132			dB
Delay Time			$31/f_S$		sec
De-Emphasis Error				±0.1	dB
INTERNAL ANALOG FILTER					
–3dB Bandwidth			100		kHz
Passband Response	f = 20kHz		–0.16		dB
POWER SUPPLY REQUIREMENTS					
Voltage Range	V_{DD}, V_{CC}	4.5	5	5.5	VDC
Supply Current: $I_{CC} + I_{DD}$	f_S = 44.1kHz		35	105	mA
	f_S = 96kHz		93		mA
Power Dissipation	f_S = 44.1kHz		425	525	mW
	f_S = 96kHz		465		mW
TEMPERATURE RANGE					
Operating		–25		+70	°C
Storage		–55		+100	°C
Thermal Resistance, θ_{JA}			67		°C/W

NOTES: (1) Refer to the System Clock section of this data sheet. (2) An external buffer is recommended. (3) Dynamic performance specifications are tested with 20kHz low-pass filter and THD+N specifications are tested with 30kHz LPF, 400Hz HPF, Average Mode. (4) Dynamic performance specifications are tested with HDCD gain scaling set to analog gain scaling. (5) SNR is tested with infinite zero detection off. (6) Output level is for sine wave. DAC outputs 0.64 V_{CC} (peak-to-peak) due to filter response as transient.

SPECIFICATIONS

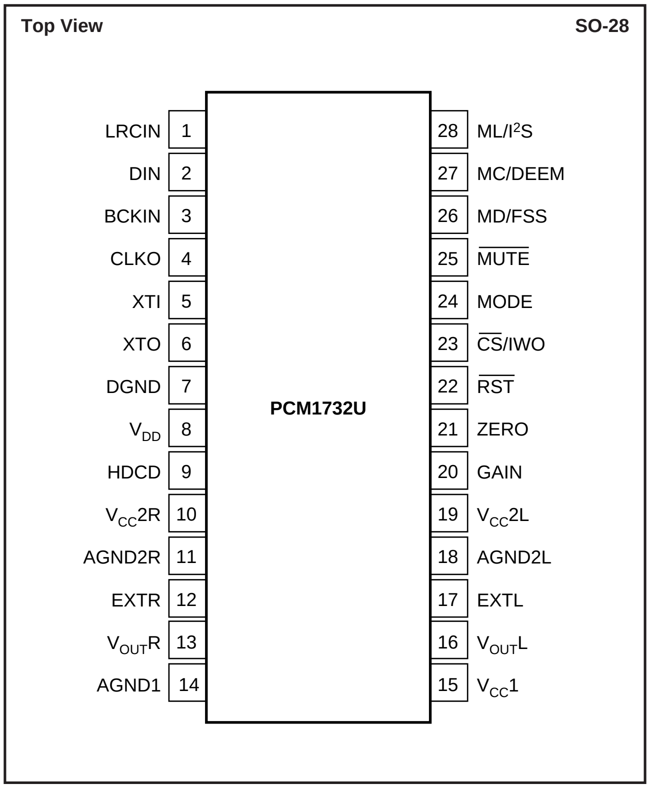
16-Bit Data Performance

All specifications at +25°C, $+V_{DD} = +V_{CC} = +5V$, f_S = 44.1kHz, and SYSCLK = $384f_S$, unless otherwise noted. For discussion of HDCD scaling options, see the Applications Considerations section of this data sheet.

PARAMETER	CONDITIONS	PCM1732U			UNITS
		MIN	TYP	MAX	
DYNAMIC ANALOG PERFORMANCE, STANDARD CD, ANALOG HDCD SCALING(1)					
Total Harmonic Distortion + Noise					
V_O = 0dB	0dBFS		–95		dB
V_O = –60dB			–37		dB
Dynamic Range	EIAJ A-Weighted		99		dB
Output Voltage, Sine Wave	0dBFS(2)		$0.57V_{CC}$		Vp-p
DYNAMIC ANALOG PERFORMANCE, HDCD CD, ANALOG HDCD SCALING(3)					
Total Harmonic Distortion + Noise					
V_O = 0dB	0dBFS		–94		dB
V_O = –60dB			–38		dB
Dynamic Range	EIAJ A-Weighted(4)		104		dB
Output Voltage, Sine Wave	0dBFS, Without Peak Extend(2)		$0.57V_{CC}$		Vp-p
	0dBFS, With Peak Extend(5)		$0.285V_{CC}$		Vp-p
	+6dBFS(5, 6)		$0.57V_{CC}$		Vp-p
DYNAMIC ANALOG PERFORMANCE, Standard CD, Digital HDCD SCALING(1)					
Total Harmonic Distortion + Noise					
V_O = 0dB	0dBFS		–92		dB
V_O = –60dB			–33		dB
Dynamic Range	EIAJ A-Weighted		96		dB
Output Voltage, Sine Wave	0dBFS		$0.285V_{CC}$		Vp-p
DYNAMIC ANALOG PERFORMANCE HDCD CD, Digital HDCD SCALING(2)					
Total Harmonic Distortion + Noise					
V_O = 0dB	0dBFS		–91		dB
V_O = –60dB			–34		dB
Dynamic Range	EIAJ A-Weighted(4)		104		dB
Output Voltage, Sine Wave	0dBFS		$0.285V_{CC}$		Vp-p
	+6dBFS(5)		$0.57V_{CC}$		Vp-p

NOTES: (1) Without dither. (2) Gain pin is LOW. (3) With the rectangular PDF dither. (4) Including Peak Extend to +6dBFS. (5) Gain pin is HIGH. (6) +6dBFS is the full Peak Extend, while dynamic range numbers are with Peak Extend.

PIN CONFIGURATION



PIN ASSIGNMENTS

PIN	NAME	I/O	DESCRIPTION
1	LRCIN	IN	Left and Right Clock Input. This clock is equal to the sampling rate, f_S.(1)
2	DIN	IN	Serial Audio Data Input(1)
3	BCKIN	IN	Bit Clock Input for Serial Audio Data(1)
4	CLKO	OUT	Buffered System Clock Output.
5	XTI	IN	Oscillator Input/External Clock Input(2)
6	XTO	OUT	Oscillator Output
7	DGND	—	Digital Ground
8	V_{DD}	—	Digital Power +5V
9	HDCD	OUT	HDCD Encoded Data Detect
10	V_{CC}2R	—	Analog Power +5V, Rch
11	AGND2R	—	Analog Ground, Rch
12	EXTR	—	Common Mode Voltage for Analog Output Amp, Rch
13	V_{OUT}R	OUT	Analog Voltage Output, Rch
14	AGND1	—	Analog Ground
15	V_{CC}1	—	Analog Power +5V
16	V_{OUT}L	OUT	Analog Voltage Output, Lch
17	EXTL	—	Common Mode Voltage for Analog Output Amp, Lch
18	AGND2L	OUT	Analog Ground, Lch
19	V_{CC}2L	—	Analog Power +5V, Lch
20	GAIN	OUT	External (analog) Gain Scaling
21	$\overline{\text{ZERO}}$	OUT	Zero Data Flag
22	$\overline{\text{RST}}$	IN	Reset. When this pin is LOW, the digital filter and modulators are held in reset.(3)
23	$\overline{\text{CS}}$/IW0	IN	Chip Select/Input Format Selection. When this pin is LOW, the Mode Control interface is enabled.(4)
24	MODE	IN	Mode Control Select: H = Software; L = Hardware(3)
25	$\overline{\text{MUTE}}$	IN	Mute Control(3)
26	MD/FSS	IN	Mode Data/Sampling Rate Range Select(3)
27	MC/DEM	IN	Mode Clock/De-Emphasis Select(3)
28	ML/I2S	IN	Mode Latch/Input Format Select(3)

NOTES: (1) Schmitt Trigger input. (2) CMOS logic level input. (3) Schmitt Trigger input with pull-up resister. (4) Schmitt Trigger input with pull-down resistor.

ABSOLUTE MAXIMUM RATINGS

Power Supply Voltage .... +6.5V
+V_{CC} to +V_{DD} Difference .... ±0.1V
Input Logic Voltage .... –0.3V to (V_{DD} + 0.3V)
Input Current (except power supply) .... ±10mA
Power Dissipation 750mW
Operating Temperature Range .... –25°C to +70°C
Storage Temperature .... –55°C to +125°C
Lead Temperature (soldering, 5s) .... +260°C
(reflow, 10s) .... +235°C

PACKAGE/ORDERING INFORMATION

PRODUCT	PACKAGE	PACKAGE DRAWING NUMBER(1)	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	ORDERING NUMBER(2)	TRANSPORT MEDIA
PCM1732U	SO-28	217	–25°C to +70°C	PCM1732U	PCM1732U	Rails
"	"	"	"	"	PCM1732U/1K	Tape and Reel

NOTES: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book. (2) Models with a slash (/) are available only in Tape and Reel in the quantities indicated (e.g., /1K indicates 1000 devices per reel). Ordering 1000 pieces of “PCM1732U/1K” will get a single 1000-piece Tape and Reel. For detailed Tape and Reel mechanical information, refer to Appendix B of Burr-Brown IC Data Book.

ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Reversible motor driver

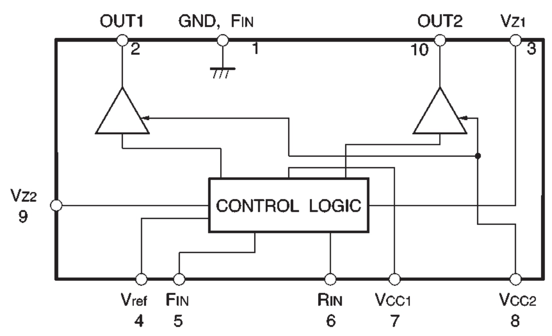
BA6209 / BA6209N

The BA6209 and BA6209N are reversible-motor drivers suitable for brush motors. Two logic inputs allow three output modes : forward, reverse, and braking. The motor revolving speed can be set arbitrarily by controlling the voltage applied to the motor with the control pin voltage V_R.

●Applications
VCRs and cassette tape recorders

●Features
1) Power transistors can handle a large current (1.6A maximally).
2) Brake is applied when stopping the motor.
3) Built-in function to absorb rush currents generated by reversing and braking.
4) Motor speed controlling pin.
5) Small standby current. (V_{CC} = 12V, I_O = 5.5mA typically)
6) Stable operation during mode changes either from forward to reverse or vice versa.
7) Interface with CMOS devices.

●Block diagram



●Absolute maximum ratings (Ta = 25°C)

Parameter		Symbol	Limits	Unit
Power supply voltage		V_{CC}	18	V
Power dissipation	BA6209	Pd	2200*1	mW
	BA6209N		1000*2	
Output current		I_O	1.6*3	A
Input voltage		V_{IN}	−0.3～V_{CC}	V
Operating temperature		Topr	−20～+75	℃
Storage temperature		Tstg	−55～+125	℃

*1 Reduced by 22 mW for each increase in Ta of 1℃ over 25℃.
*2 Reduced by 10 mW for each increase in Ta of 1℃ over 25℃.
*3 500 μs pulse with a duty ratio of 1%.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage 1 (Logic section)	V_{CC1}	6.0	−	18.0	V
Operating voltage 2 (Output section)	V_{CC2}	−	−	18.0	V

●Electrical characteristics (unless otherwise noted, Ta = 25°C and V_{CC} = 12V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Current dissipation	I_{CC}	−	5.5	10	mA	$F_{IN}=R_{IN}=GND,\ R_L=\infty$
Minimum input ON current	I_{IN}	−	10	50	μA	$R_L=\infty$
Input threshold voltage	V_{TH}	0.7	1.2	2.0	V	$R_L=\infty$
Output leakage current	I_{OL}	−	−	1.0	mA	$F_{IN}=R_{IN}=GND,\ R_L=\infty$
Output voltage	V_O	6.6	7.2	−	V	$R_L=60\Omega$, ZD=7.4V

●Electrical characteristic curves

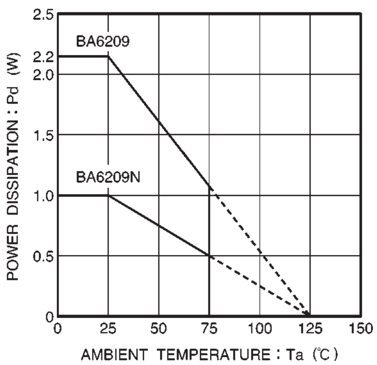


Fig.1 Temperature dependence power dissipation curves

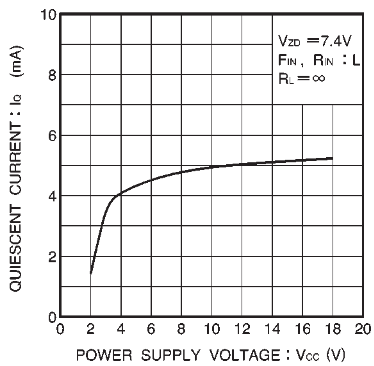


Fig.2 Quiescent current vs. power supply voltage

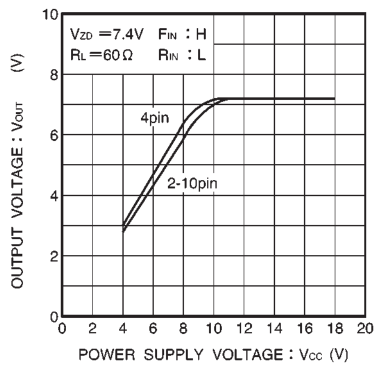


Fig.3 Maximum output voltage vs. power supply voltage (I)

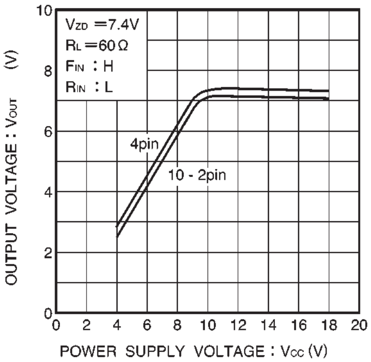


Fig.4 Maximum output voltage vs. power supply voltage (II)

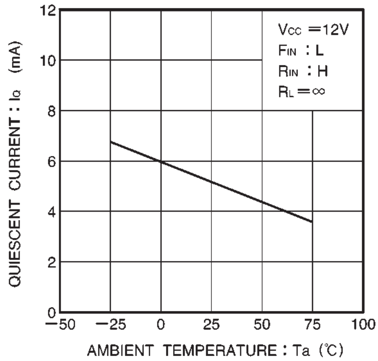


Fig.5 Quiescent current vs. ambient temperature

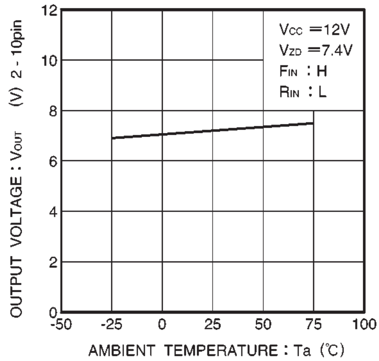


Fig.6 Output voltage vs. ambient temperature

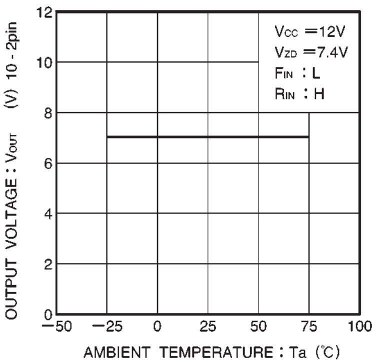


Fig.7 Output voltage vs. ambient temperature

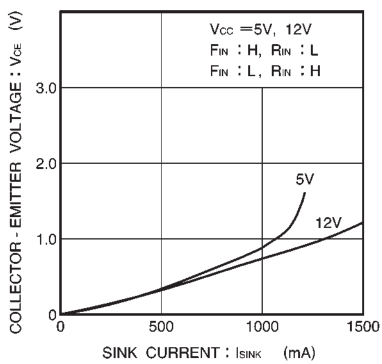


Fig.8 Output saturated voltage vs. sink current (I)

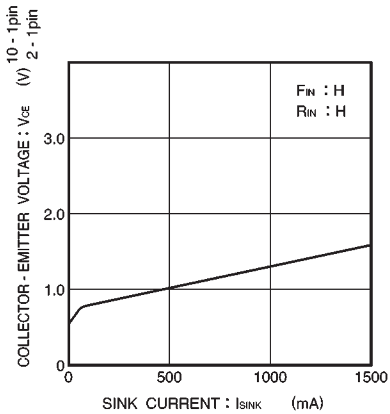


Fig.9 Output saturated voltage vs. sink current (II)

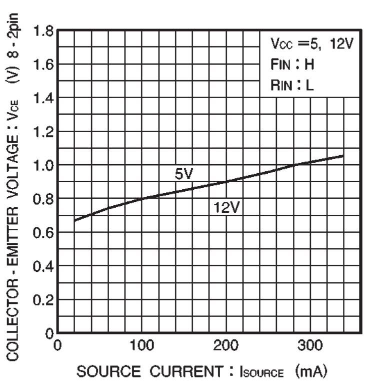


Fig.10 Output saturated voltage vs. source current (I)

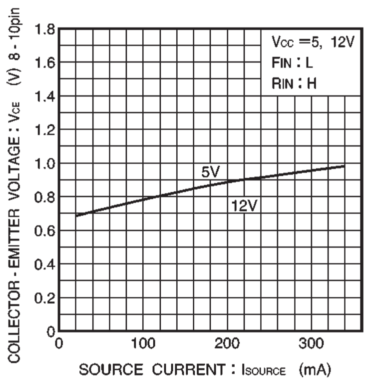


Fig.11 Output saturated voltage vs. source current (II)

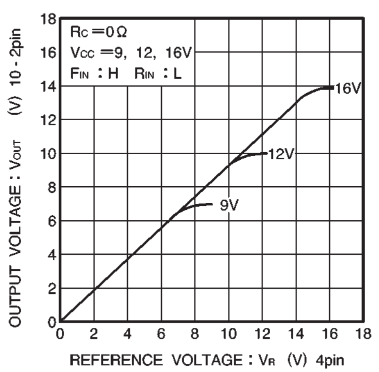


Fig.12 Output voltage vs. reference voltage (I)

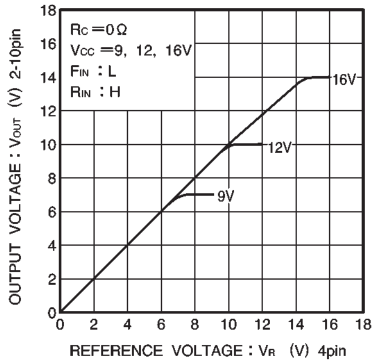


Fig.13 Output voltage vs. reference voltage (Ⅱ)

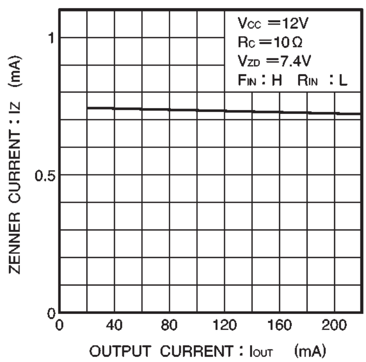


Fig.14 Zener current vs. output current

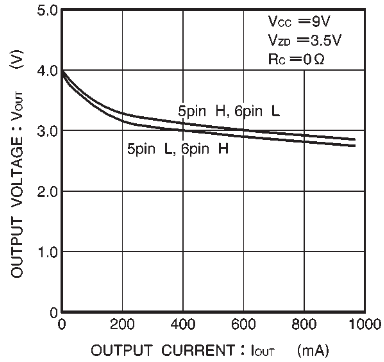


Fig.15 Output voltage vs. output current

●Measurement circuit

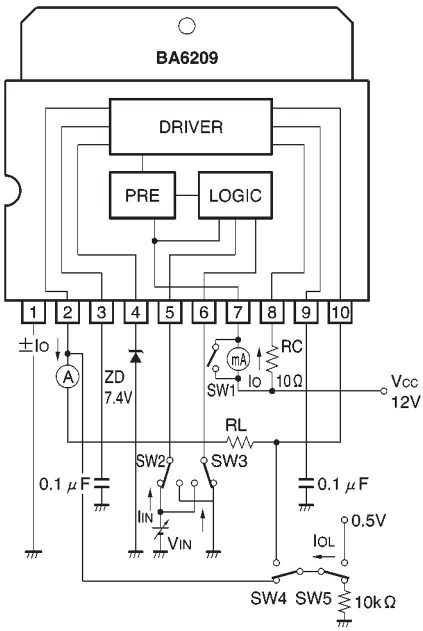


Fig.16

● Circuit operation

Input / output truth table

Input		Output	
F_{IN}	R_{IN}	OUT1	OUT2
L	L	L	L
H	L	H	L
L	H	L	H
H	H	L	L

Forward / reverse control, forced stop, and rush current absorption are controlled by the combination of F_{IN} and R_{IN} input states.

(1) Forward / reverse control circuit

When F_{IN} is HIGH and R_{IN} is LOW, current flows from OUT1 to OUT2. When F_{IN} is LOW and R_{IN} is HIGH, current flows from OUT2 to OUT1 (refer to the truth table).

(2) Forced stop circuit

By setting R_{IN} and F_{IN} both HIGH or both LOW, power supply to the motor is shut down and a brake is applied by absorbing the motor counter-electromotive force.

(3) Rush current absorption circuit

When a high voltage (caused by such as a motor reversal) is generated on OUT1 and OUT2, an internal comparator detects the high voltage and turns on an internal circuit that absorbs rush currents.

(4) Drive circuit

The forward direction of the motor connected between OUT1 and OUT2 corresponds to the current flow from OUT1 to OUT2, and the reverse direction corresponds to the current flow from OUT2 to OUT1. The output voltage (V_{OUT}) applied to the motor is given by the equation :

V_{OUT} (V) = $V_{ZD} - V_{CE}$ (sat.) = $V_{ZD} - 0.2$ (I_{OUT} = 100mA)

where V_{ZD} is the zener voltage of the constant voltage diode (ZD) connected to pin 4.

If V_{ref} is left OPEN, the output voltage (V_{OUT}) is given by the equation :

V_{OUT} (V) = $V_{CC}1 - V_{CE}$ (sat.) (PNP) $- 2V_F - V_{CE}$ (sat.) = $V_{CC}1 - 1.8$ (I_{OUT} = 100mA)

● Pin descriptions

Pin No.	Pin name	Function
1	GND	GND
2	OUT 1	Motor output
3	V_{Z1}	Capacitor connection pin for preventing both output transistors being turned on at the same time
4	V_{ref}	Output HIGH voltage setting
5	F_{IN}	Logic input
6	R_{IN}	Logic input
7	V_{CC1}	Control circuit power supply
8	V_{CC2}	Output power supply
9	V_{Z2}	Capacitor connection for preventing both output transistors being turned on at the same time
10	OUT 2	Motor output

MCU Pin Arrangement and Functions

Pin Arrangement

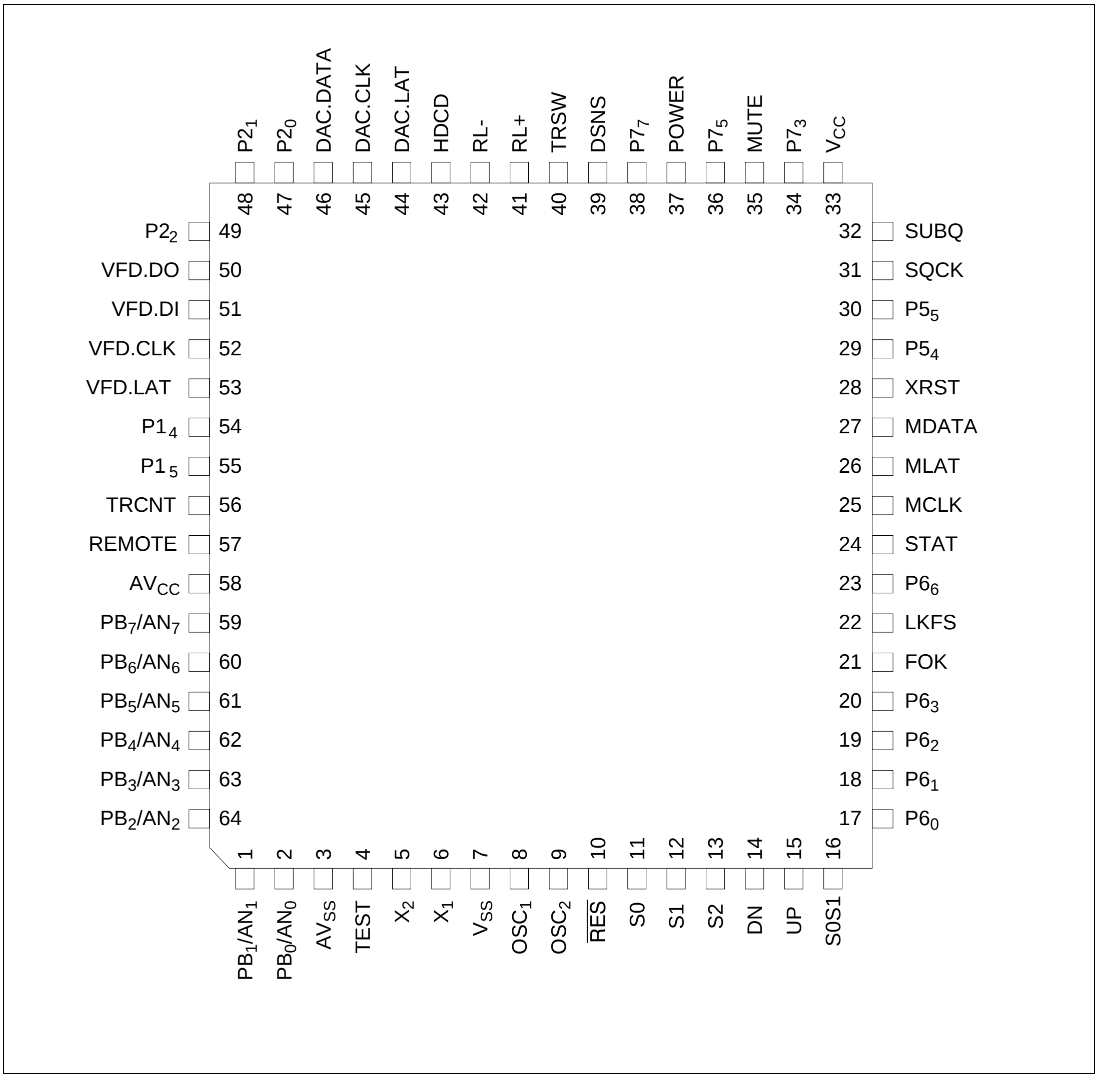


Figure 1.2 Pin Arrangement

Internal Block Diagram

Figure 1.1 shows a block diagram.

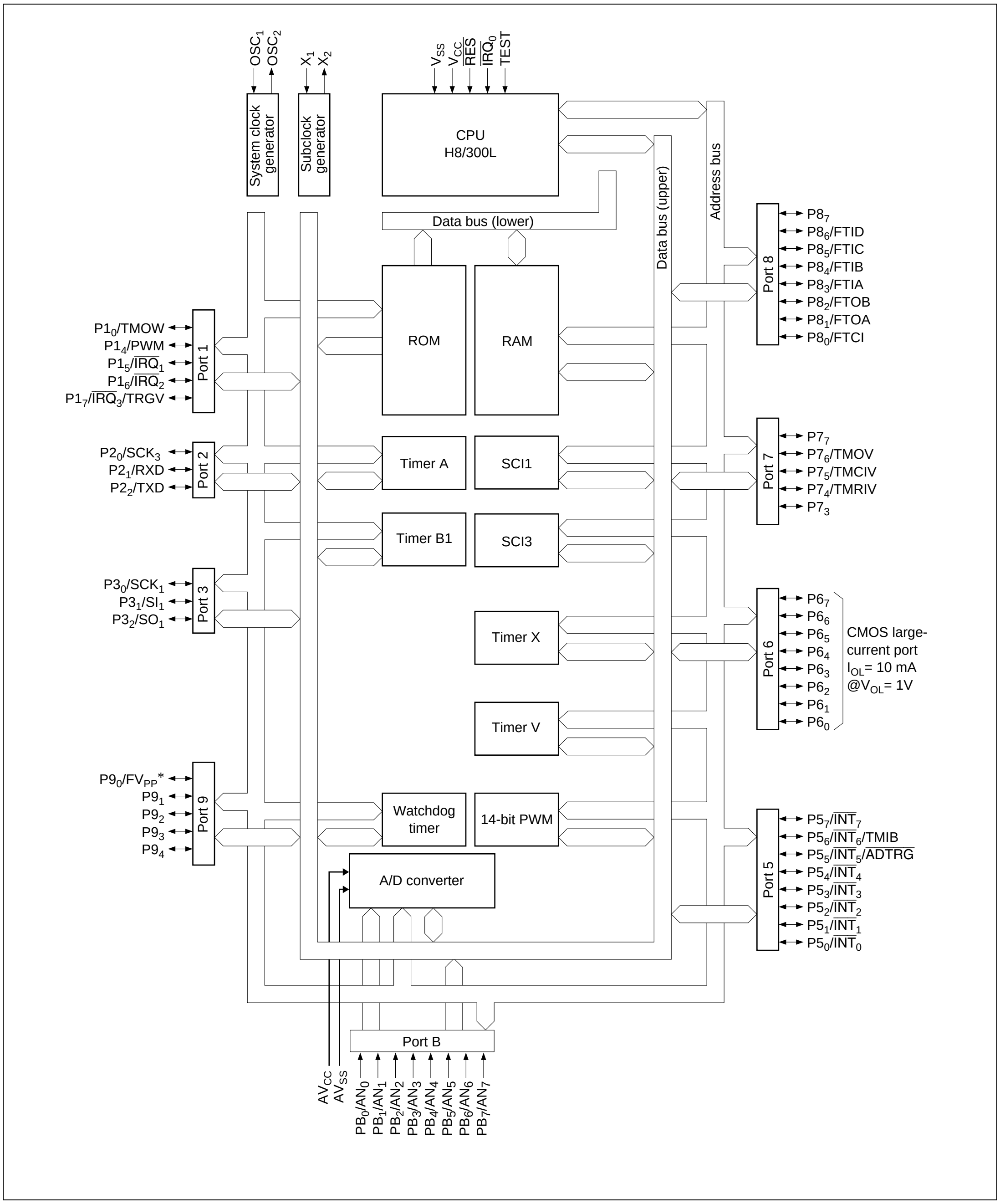


Figure 1.1 Block Diagram

Pin Functions

Pin	Name	Description
1	PB1	No connection
2	PB0	No connection
3	AVSS	Connected 0V
4	TEST	Connected 0V
5	X2	No connection
6	X1	Connected 5V
7	VSS	MCU ground line; connected to 0V
8	OSC1	10MHz crystal input
9	OSC2	10MHz crystal input
10	RES	MCU reset line; 0V = reset; 5V = normal operation
11	S0	CD Changer Mechanism door position switch
12	S1	CD Changer Mechanism door position switch
13	S2	CD Changer Mechanism door position switch
14	DN	CD Changer Mechanism door motor control line
15	UP	CD Changer Mechanism door motor control line
16	S0S1	CD DSP SUBQ ready input; high pulse for SUBQ ready
17	P60	No connection
18	P61	No connection
19	P62	No connection
20	P63	No connection
21	FOK	CD DSP focus OK; 5V = focus OK
22	LKFS	CD DSP tracking lock output; 5V = servo lock
23	P66	No connection
24	STAT	CD DSP internal status output
25	MCLK	CD DSP serial command clock
26	MLAT	CD DSP command latch
27	MDATA	CD DSP serial command data
28	XRST	CD DSP reset line; 0V = DSP reset
29	P54	No connection
30	P55	No connection
31	SQCK	SUBQ output serial clock
32	SUBQ	SUBQ output
33	VCC	MCU power supply; connected to 5V
34	P73	No connection
35	MUTE	System mute control; 5V = mute
36	P75	No connection
37	POWER	Servo power on/off control; 5V = power on
38	P77	No connection
39	DSNS	Disc detection optical sensor output; 0V = disc present
40	TRSW	Carousel position detection optical sensor output
41	RL+	Carousel motor line
42	RL-	Carousel motor line
43	HDCD	HDCD decoding status from PCM1732; 5V = HDCD
44	DAC.LAT	PCM1732 serial command latch
45	DAC.CLK	PCM1732 serial command clock
46	DAC.DATA	PCM1732 serial command data
47	P20	No connection
48	P21	No connection

49	P22	No connection
50	VFD.DO	Display driver status serial data
51	VFD.DI	Display driver command serial data
52	VFD.CLK	Display driver command serial clock
53	VFD.LAT	Display driver command serial latch
54	P14	No connection
55	P15	No connection
56	TRCNT	CD DSP internal status for auto-adjustment
57	REMOTE	IR remote signal input
58	AVCC	Connected to 5V
59	PB7	No connection
60	PB6	No connection
61	PB5	No connection
62	PB4	No connection
63	PB3	No connection
64	PB2	No connection

REF. NO.	PART NO.	DESCRIPTION	QTY
FL8370 MAIN BOARD			
RESISTORS			
R312	1001-000310-000	CARBON FILM RESISTOR 10 OHM 1W +-5%	1
R322/375	1001-000312-000	CARBON FILM RESISTOR 10 OHM 1/2W +-5%	2
R378/379/392	1001-001316-000	CARBON FILM RESISTOR 100 OHM 1/6 W +-5%	3
J133-136/139/140/220/221/224/228 R345/377/381	1001-002316-000	CARBON FILM RESISTOR 1K OHM 1/6 W +-5%	13
J234/322 &R304/305 R315-319/321/323/324/346/387/396	1001-003316-000	CARBON FILM RESISTOR 10K OHM 1/6 W +-5%	15
R320/347/391/397	1001-004316-000	CARBON FILM RESISTOR 100K OHM 1/6 W +-5%	4
R344	1001-005316-000	CARBON FILM RESISTOR 1M OHM 1/6 W +-5%	1
R353/355	1001-203316-000	CARBON FILM RESISTOR 12K OHM 1/6W +-5%	2
R352	1001-204316-000	CARBON FILM RESISTOR 120K OHM 1/6 W +-5%	1
R348	1001-504316-000	CARBON FILM RESISTOR 150K OHM 1/6 W +-5%	1
R349	1001-804316-000	CARBON FILM RESISTOR 180k OHM 1/6W +-5%	1
R357	1002-200316-000	CARBON FILM RESISTOR 22 OHM 1/6 W +-5%	1
R308/309/388/389	1002-201316-000	CARBON FILM RESISTOR 220 OHM 1/6 W +-5%	4
R306/339/382	1002-202316-000	CARBON FILM RESISTOR 2.2K OHM 1/6 W +-5%	3
R303/395	1002-203316-000	CARBON FILM RESISTOR 22K OHM 1/6 W +-5%	2
R390	1002-403316-000	CARBON FILM RESISTOR 24K OHM 1/6W +-5%	1
R340	1002-703316-000	CARBON FILM RESISTOR 27K OHM 1/6 W +-5%	1
R325/380	1003-300314-000	CARBON FILM RESISTOR 33 OHM 1/4W +-5%	2
R341/342	1003-302316-000	CARBON FILM RESISTOR 3.3K OHM 1/6 W +-5%	2
R394	1003-900310-000	CARBON FILM RESISTOR 39 OHM 1W +-5%	1
R383	1003-900320-000	CARBON FILM RESISTOR 39 OHM 2W +-5%	1
R336-338	1004-701316-000	CARBON FILM RESISTOR 470 OHM 1/6 W +-5%	3
R310-311	1004-702316-000	CARBON FILM RESISTOR 4.7K OHM 1/6 W +-5%	2
R350	1004-704316-000	CARBON FILM RESISTOR 470K OHM 1/6 W +-5%	1
C390 & J355	1005-602316-000	CARBON FILM RESISTOR 5.6K OHM 1/6 W +-5%	1
R393	1007-500316-000	CARBON FILM RESISTOR 75 OHM 1/6W +-5%	1
R356	1008-200316-000	CARBON FILM RESISTOR 82 OHM 1/6W +-5%	1
R343/376	1008-202316-000	CARBON FILM RESISTOR 8.2K OHM 1/6 W +-5%	2
R351	1008-204316-000	CARBON FILM RESISTOR 820K OHM 1/6 W +-5%	1
R358-359/363	1011-002018-000	METAL FILM RESISTOR 1K OHM 1/8W +-1%	3
R331/332/360	1011-003018-000	METAL FILM RESISTOR 10K 1/8W +-1%	3
R364/372	1011-004018-000	METAL FILM RESISTOR 100K OHM 1/8W +-1%	2
R326/327/328/335/354/	1011-203016-000	METAL FILM RESISTOR 12K OHM 1/6W +-1%	5

R362/365/374	1011-504018-000	METAL FILM RESISTOR 150K OHM 1/8W +-1%	3
R330/334	1011-803016-000	METAL FILM RESISTOR 18K 1/6W + -1%	2
R371	1012-703018-000	METAL FILM RESISTOR 27K OHM 1/8W +-1%	1
R366	1012-704018-000	METAL FILM RESISTOR 270K OHM 1/8W + -1%	1
R361	1013-902018-000	METAL FILM RESISTOR 3.9K OHM 1/8W +-1%	1
R367	1014-303018-000	METAL FILM RESISTOR 43K OHM 1/8W +-1%	1
R384/385	1014-702018-000	METAL FILM RESISTOR 4.7K OHM 1/8W +-1%	2
R368/373	1014-703018-000	METAL FILM RESISTOR 47K 1/8W +-1%	2
R369	1015-603018-000	METAL FILM RESISTOR 56K OHM 1/8W +-1%	1
R329/333	1016-202016-000	METAL FILM RESISTOR 6.2K OHM 1/6W +-1%	2
R370	1016-803018-000	METAL FILM RESISTOR 68K OHM 1/8W +-1%	1

CAPACITORS

C384	1100-101043-000	CERAMIC CAP. 100PF/50V +-10%	1
C367/386/408/410	1100-102043-000	CERAMIC CAP. 1000PF/50V +-10%	4
R389	1100-103043-000	CERAMIC CAP. 0.01uF/50V +-10%	1
C259/264/268/273/301/303/325/335-338/ 355/356/361/374/377/378/391/ 396/405-407/409/412-414	1100-104014-000	CERAMIC CAP. 0.1UF/16V +-20%	26
C339/340/387/388	1100-220043-000	CERAMIC CAP. 22pF/50V +-20%	4
C322/323	1100-221042-000	CERAMIC CAP. 220PF/50V +-5%	2
C348	1100-223043-000	CERAMIC CAP. 0.022UF/50V +-10%	1
C368	1100-407043-000	CERAMIC CAP. 4pF/50V + -10%	1
C189	1100-827043-000	CERAMIC CAP. 8.2pF/50V +-10%	1
C352/353/360/371/373	1101-103062-000	POLYESTER/MYLAR CAP. 0.01UF/100V +-5%	5
C364/365	1101-104063-000	POLYESTER/MYLAR CAP. 0.1UF/100V +-10%	2
C310/314	1101-122062-000	POLYESTER/MYLAR CAP. 0.0012UF/100V +-5%	2
C362	1101-124063-000	POLYESTER/MYLAR CAP. 0.12UF/100V +-10%	1
C370/393	1101-152062-000	POLYESTER/MYLAR CAP. 0.0015UF/100V +-5%	2
C357/363	1101-222062-000	POLYESTER/MYLAR CAP. 2200PF/100V +-5%	2
C359	1101-272062-000	POLYESTER/MYLAR CAP. 2700PF/100V +-5%	1
C349/394	1101-333062-000	POLYESTER/MYLAR CAP. 0.033UF/100V +-5%	2
C369	1101-472062-000	POLYESTER/MYLAR CAP. 4700PF/100V +-5%	1
C392	1101-473062-000	POLYESTER/MYLAR CAP. 0.047UF/100V +-5%	1
C358	1101-682062-000	POLYESTER/MYLAR CAP. 0.0068UF/100V +-5%	1
C307/341-346/375/380/398	1102-100014-000	ELECT. CAP. 10UF/16V +-20%	10
C385	1102-100024-000	ELECT. CAP. 10UF/25V +-20%	1
C258/327/347/382/383 C366/402-404/259 & 215	1102-101014-000	ELECT. CAP. 100uF/16V +-20%	9
C399	1102-101034-000	ELECT.CAP. 100UF/35V +-20%	1
C330/397	1102-102014-000	ELECT. CAP. 1000UF/16V +-20%	2
CC381	1102-107044-000	ELECT. CAP. 1uF/50V +-20%	1

C312/316/390	1102-220014-000	ELECT. CAP. 22uF/16V +-20%	3
C318/320	1102-220024-001	ELECT CAP 22UF/25V +-20% FM SERIES NICHICON	2
C395	1102-221014-000	ELECT. CAP. 220UF/16V +-20%	1
C400/401	1102-221024-000	ELECT. CAP. 220UF/25V +-20%	2
C332/333/334	1102-222014-000	ELECT. CAP. 2200uF/16V +-20%	3
C379	1102-228044-000	ELECT. CAP. 0.22uF/50V +-20%	1
C376/415	1102-330024-000	ELECT. CAP. 33uF/25V +-20%	1
C267/302/304-306/308/309/331	1102-471014-000	ELECT. CAP. 470uF/16V +-20%	8
C372	1102-477044-000	ELECT. CAP. 4.7uF/50V +-20%	1
C350/351	1102-478024-000	ELECT. CAP. 0.47uF/25V +- 20%	2
C354	1181-680042-000	CERAMIC CAP. 68PF/50V +-5% NPO	1
C321/324	1187-820042-000	CERAMIC CAP. 82PF/50V + -5% N750 + - 120PPM	2

TRANSISTORS

Q312	1300-100300-100	TRANSISTOR NPN KSR1003 (SAMSUNG)	1
Q301/303-307	1300-945000-100	TRANSISTOR NPN KSC945-Y (SAMSUNG)	6
Q302	1301-273300-101	TRANSISTOR PNP 2SA733Y	1
Q310	1301-564000-100	TRANSISTOR PNP KSB564A-Y (SAMSUNG)	1
Q308	1301-855000-100	TRANSISTOR PNP SS8550C TO-92 (SAMSUNG)	1

DIODES

BR301	1401-101000-000	BRIDGE RECTIFIER DB101 50V 1A UL	1
D301-308	1401-140040-000	DIODE RECTIFIER 1N4004	8
D309-311/314/ C390 & J355	1401-141480-000	DIODE 1N4148	6
Z304	1402-160001-100	ZENER DIODE MTZ16A 1/2	1
Z305	1402-560000-000	ZENER DIODE 5.6V 0.5W	1
Z301-303	1402-620001-200	ZENER DIODE 6.2V 1/2W	3
J192/215	1503-560300-100	FERRITE IND. 56uH +-10% 2.5 X 7H (812034)	1

MISCELLANEOUS

X301	1600-100003-000	CRYSTAL 10MHz +-30PPM 49U TYPE	1
X302	1600-169343-000	CRYSTAL 16.9344 +- 30 PPM 49U3H TYPE	1
CN310/318	2300-002000-001	STRAIGHT CONN WAFER 2PIN 2MMP JST	2
CN311 & J275/315	2300-003000-001	STRAIGHT CONN WAFER 3PIN 2MMP JST	3
CN302	2300-003100-000	STRAIGHT CONN. WAFER 3 PINS 2.5mmP	1
CN306	2300-004000-002	STRAIGHT CONN WAFER 4PINS 2MMP JST	1
CN303/308/316-317	2300-006000-001	STRAIGHT CONN WAFER 6 PIN 2MMP JST	4
CN301	2300-006100-003	STRAIGHT CONN. WAFER 6PINS 2.5MMP (SHS)	1
CN309	2300-008000-002	STRAIGHT CONN WAFER 8PINS 2MMP JST	1
CN310 TO 311	2501-031501-140	3PIN 150MM 2CONN CABLE AWG#26 2MMP	1
CN307	2501-102501-140	10PIN 250MM 2CONN CABLE 2MMP #26 JST (1 BOARD IN)	1
CN305 TO CN306	2503-042101-041	4PIN 210MM 1CONN FLAT CABLE AWG#26 UL2468	1

		2MMP BLK	
J275	2510-036501-050	3PINS 650MM 1 CONN SHIELD CABLE AWG#28 2MMP	1
CN313	2510-043501-060	4PIN 350MM 1CONN SHIELD CABLEX2 AWG#30 2MMP	1
CN314	2510-047001-050	4PIN 700MM 1 CONN SHIELD CABLE AWG#28 2MMP	1
CN318	2511-024001-140	2PIN 400MM 2CONN SHIELD CABLE AWG#26 2MMP	1
CN315	2511-034201-150	3PIN 420MM 2CONN SHIELD CABLE AWG#28 2MMP	1
CN308	2511-062501-161	6PIN 250MM 2CONN R.ANGLE SHIELD C.#30 2MM (1BD.IN)	1
CN309	2511-082501-161	8PIN 250MM 2CONN R.ANGLE SHIELD C. #30 2MM (1BD.IN)	1
L1-L2,L3-L4	2590-030080-060	3PIN 80MM SHIELD CABLE AWG#30 (WITH ONE SIDE GND)	1
P8 TO D301	2600-100804-200	80MM JUMPER WIRE AWG#26 RED	1
P14 TO P15	2600-101001-200	100MM JUMPER WIRE AWG#20 UL1015 RED	1
T1	3299-961260-000	DIGITAL OUTPUT COIL 7DL-N961266(TOHO)	1

FUSE

F301	4030-160000-512	1.6A 5x20mm SLOW BLOW	1
FOR F301	4031-004000-000	FUSE CLIP FOR 5X20MM HF-004/P	2

RELAY

RL302	4050-232300-000	RELAY DS2Y-S-DC12V (NATIONAL)	1
RL301	4050-520000-000	RELAY DS2Y-S-DC5V (NATIONAL)	1

INTEGRATED CIRCUITS

U307	4117-320104-600	PCM1732 VOLTAGE OUTPUT DELTA-SIGMA DAC BURR-BROWN	1
U313-314	4155-320052-100	I.C. NE5532N 8P DIP PHILIPS	2
U306	4162-090002-300	I.C. BA6209 SIL MOTOR DRIVER (ROHM)	1
U305	4162-090002-301	IC BA6209N SIL MOTOR DRIVER WITHOUT HEAT SINK ROHM	1
U301-302	4178-050301-400	I.C. MC7805AC 3 PINS TO-220 (MOTOROLA)	2
U316	4178-050310-000	I.C. LM78L05 TO92	1
U315	4178-080302-600	I.C. L7808CV TO-220 (SGS-THOMSON)	1
U303	4178-080310-000	I.C. 78L08 TO92 (MIRCO)	1
U304	4179-080311-600	I.C. 79L08 TO92 (NJRC)	1
U308	4192-230122-400	I.C. KB9223 QFP SAMSUNG SSP	1
U312	4192-580122-400	I.C. KA9258D SMT SAMSUNG MOTOR DRIVE	1
U309	4192-840122-400	I.C.KS9284 QFP SAMSUNG DSP	1
U310	4201-837000-601	I.C. 5DISC MCU 8370-12 HD 6433643RA94H (HITACHI)	1

PBC

	4883-700010-101	FL8370 MAIN BOARD REV A	1

FL8370 HEADPHONE BOARD

RESISTORS

R513/514	1001-002316-000	CARBON FILM RESISTOR 1K OHM 1/6 W +-5%	2
R511/512	1001-003316-000	CARBON FILM RESISTOR 10K OHM 1/6 W +-5%	2
R507/510	1001-004316-000	CARBON FILM RESISTOR 100K OHM 1/6 W +-5%	4
R503/504	1001-503316-000	CARBON FILM RESISTOR 15K OHM 1/6 W +-5%	2
R515/516	1005-600314-000	CARBON FILM RESISTOR 56 OHM 1/4W +-5%	2
R501/502	1006-800314-000	CARBON FILM RESISTOR 68 OHM 1/4W +-5%	2
R505	1065-003500-130	VAR. RESISTOR 50k 1/4W +-20% ROTARY B-TYPE	1

CAPACTIORS

C509/510	1100-102044-000	CERAMIC CAP. 1000PF/50V +-20%	2
C511	1100-103044-000	CERAMIC CAP. 0.01UF/50V +-20%	1
C503/504/511	1100-104044-000	CERAMIC CAP. 0.1uF/50V +-20%	3
C505/512	1102-100014-000	ELECT. CAP. 10UF/16V +-20%	2
C501-502	1102-101014-000	ELECT. CAP. 100uF/16V +-20%	2
C507/508	1102-471014-000	ELECT. CAP. 470uF/16V +-20%	1

MISCELLANEOUS

CN501-502	2300-003000-001	STRAIGHT CONN WAFER 3PIN 2MMP JST	2
U502	2320-009911-003	6.4MM HEADPHONE JACK (JY-6303-02-030) GOLD PLATED	1
	2605-100902-000	90MM GND WIRE 1RING (M3) AWG#22 BLK	1

INTEGRATED CIRCUITS

U502	4145-580051-600	IC NJM 4558L	1

PCB

	4883-500020-003	FL8350 HEADPHONE BOARD REV C	1

FL8370 CONTROL BOARD 1

MISCELLANEOUS

S831-835	2400-020200-000	TACT SW 2P2T KPT-1105A (5MM)	5
W831	2500-062101-050	6PIN 210MM 1CONN CABLE AWG#28 2MMP	1

PCB

	4883-700040-001	FL8370 CONTROL BOARD REV A	1

FL8370 POWER BOARD

MISCELLANEOUS

	2610-218300-002	AC POWER CORD NON-INTEGRAL SPT-2 UL/CSA (LUEN MING)	1
	3200-480150-400	TRANSFORMER EI48 117V CUL #4801Y52T(WINBOND)	1
	4002-311975-000	TOROID COILS 'T31X19X7.5MM'	1

FL8370 POWER CONTROL BOARD

MISCELLANEOUS

S841	2402-020200-003	PUSH SWITCH 2P2T ESB64801 MATSUSHITA	1
W841	2500-052001-050	5PIN 200MM 1CONN CABLE AWG#28 UL1571 2MMP	1
D841	3100-204000-001	LED 5MM BI- COLOR A/G #BL-BAG204	1

PCB

	4883-700110-001	FL8370 POWER CONTROL BOARD REV A	1

FL8370 VFD BOARD

RESISTORS

R405	1001-001314-000	CARBON FILM RESISTOR 100 OHM 1/4 W +-5%	1
R402	1001-002316-000	CARBON FILM RESISTOR 1K OHM 1/6 W +-5%	1
R406-410	1001-003316-000	CARBON FILM RESISTOR 10K OHM 1/6 W +-5%	5
R403-404	1001-501316-000	CARBON FILM RESISTOR 150 OHM 1/6 W +-5%	1
R401	1004-703316-000	CARBON FILM RESISTOR 47K OHM 1/6 W +-5%	1

CAPACITORS

C401	1100-104045-000	CERAMIC CAP. 0.1uF/50V +80% -20%	1

MISCELLANEOUS

E401-402	1102-101004-000	ELECT. CAP. 100uF/10V +-20%	2
D402-406	1401-141480-000	DIODE 1N4148	5
W403	2300-005010-000	RIGHT ANGLE CONN WAFER 5PIN 2mmP	1
W402	2300-006010-000	HORIZONTAL CONN. WAFER 6 PINS 2mmP	1
W401	2300-010001-900	10PIN STRAIGHT CONN WAFER 2MMP SMT SM-TYPE	1
S401-415	2400-020200-000	TACT SW 2P2T KPT-1105A (5MM)	15
U402	3001-120430-001	INFRARED SENSOR PIC-12043TM	1
U403	3105-630900-000	VFD 6-BT-309GNK FUTABA	1

INTEGRATED CIRCUITS

U401	4116-311121-500	I.C. PIC16311 QFP 52PIN NEC	1

PCB

	4883-700260-002	FL8370 VFD DISPLAY BOARD REV B	1

FL8370 OUTPUT BOARD

R751	1001-001316-000	CARBON FILM RESISTOR 100 OHM 1/6 W +-5%	1
R753	1002-701316-000	CARBON FILM RESISTOR 270 OHM 1/6W +-5%	1
R750	1003-902316-000	CARBON FILM RESISTOR 3.9K OHM 1/6 W +-5%	1
R754-755	1004-700316-000	CARBON FILM RESISTOR 47 OHM 1/6W +-5%	2
R752	1004-703316-000	CARBON FILM RESISTOR 47K OHM 1/6 W +-5%	1

CAPACITORS

C755/757/762	1100-102043-000	CERAMIC CAP. 1000PF/50V +-10%	3

C751-752	1100-151044-000	CERAMIC CAP. 150PF/50V +-20%	2
C764	1100-221043-000	CERAMIC CAP. 220pF/50V +- 10%	1
C765 & P702-P704	1100-331043-000	CERAMIC CAP. 330PF/50V +-10%	2
E750	1102-101014-000	ELECT. CAP. 100uF/16V +-20%	1

TRANSISTORS

Q750	1301-200300-100	TRANSISTOR PNP KSR2003 (SAMSUNG)	1

MISCELLANEOUS

	1401-141480-000	DIODE 1N4148	2
L761	1503-000000-100	BEAD COIL FB-35608 C.T.C.	1
L751-752	1503-353400-100	FERRITE COILS B3534	1
W753	2300-002000-001	STRAIGHT CONN WAFER 2PIN 2MMP JST	1
W750	2300-003000-001	STRAIGHT CONN WAFER 3PIN 2MMP JST	1
W752	2300-004000-002	STRAIGHT CONN WAFER 4PINS 2MMP JST	1
U754-755	2321-003911-002	MIC JACK 3.5MM JY-3510-01-010	2
U753	2330-002901-000	RCA JACK RJ-1081-020-000	1
RCA1	2330-003901-302	RCA JACK PANEL MOUNT HSP-242V2-01	1
W703-CHASSIS	2605-100502-000	50MM GND WIRE 1RING (M3) AWG#22 BLACK	1

INTEGRATED CIRCUITS

U750	4181-700010-000	I.C. LTV817B LITON	1

PCB

	4883-700290-001	FL8370 OUTPUT BOARD REV A	1

FL8370 CONNECTOR DOARD

CAPACITORS

C501	1100-101043-000	CERAMIC CAP. 100PF/50V +-10%	1
C502	1100-101043-000	CERAMIC CAP. 100PF/50V +-10%	1
C503	1100-101043-000	CERAMIC CAP. 100PF/50V +-10%	1
C504	1100-101043-000	CERAMIC CAP. 100PF/50V +-10%	1

MISCELLANEOUS

CN501	2300-006010-000	HORIZONTAL CONN. WAFER 6 PINS 2mmP	1
CN502	2300-008010-000	RIGHT ANGLE CONN WAFER 8PIN 2MMP	1
CN503	2301-015910-000	15PIN FILM TYPE RIGHT ANGLE CONN. 1MMP	1
		50MM GND WIRE 1RING (M3) AWG#22 BLK	
	2504-150709-990	15PIN 70MM F.F.C. CABLE 1MMP	1.0

PCB

	4883-700120-005	FL8370 CONNECTION BOARD REV E	1.0

FL8370 SENSOR BOARD

RESISTORS

R2	1004-701316-000	CARBON FILM RESISTOR 470 OHM 1/6 W +-5%	1

R1	1007-501316-000	CARBON FILM RESISTOR 750 OHM 1/6 W +-5%	1

MISCELLANEOUS

CN1	2300-002010-000	RIGHT ANGLE CONN WAFER 2PIN 2MMP	1
CN2	2300-006010-000	RIGHT ANGLE CONN WAFER 6PIN 2MMP	1
	2500-021201-050	2PIN 120MM 1CONN CABLE AWG#26 2MMP	1
	2506-062501-150	6PIN 250MM 2CONN CABLE RIBBON AWG#28 2M	1
D2	3001-820000-000	INFARED SENSOR ST-8LR2 OPTO-SENSOR	1
D1	3004-206000-000	PHOTO COUPLER SG206 OPTO-SENSOR	1
D3	3100-800000-000	ENITTING FIODE EL-8L OPTO-SENSOR	1

PBC

	48410010130-003	5CD SENSOR BOARD REV C	1

FL8370 REMOTE UNIT

	5200-080250-030	POLYBAG 80X250X3C MM	1
	6002-000001-000-16	HARMAN KARDON FL8370 R/C TOP CASE (W/G SILKSCREEN)	1
	6002-000001-000	RT02-P001 CASE TOP	1
	6002-000002-000	RT02-P002 CASE BOTTOM	1
	6002-000003-000	RT02-P003 COVER BATTERY	1
	6002-000018-000-01	FL8370 R/C INLAY (W/30 KEYS & SILKSCREEN)	1
	6002-000018-000	INLAY 30 KEYS FOR RT-02	1
	6002-030000-100-XX	INLAY 32KEYS FOR RET-03 (W/SILKSCREEN)	1
	6002-030000-100	INLAY 32 KEYS FOR RT-03	1
	6600-010156-001	CONTACT BATTERY COMMON	1
	6600-010157-000	RT02-S002 CONTACT BATTERY POS	1
	6600-010158-000	RT02-S003 CONTACT BATTERY NEG	1
	6600-070102-000	KEY PAD 32 KEYS FOR RT03	1
FOR REAR PANEL	7002-008002-021	SCREW M2X8 P TYPE P/H BLK	1

FL8370 REMOTE CONTROL BOARD

RESISTORS

R2-5	1001-004316-000	CARBON FILM RESISTOR 100K OHM 1/6 W +-5%	4
R1	1001-507314-000	CARBON FILM RESISTOR 1.5 OHM 1/4W +-5%	1

CAPACITORS

C1/2	1100-221043-000	CERAMIC CAP. 220pF/50V +- 10%	2
C4	1102-470004-002	ELECT. CAP. 47UF/10V +-20% MINI SIZE	1

TRANSISTORS

Q1/2	1300-212000-100	TRANSISTOR NPN C2120Y TO-92	2

DIODE

D1	1401-113300-000	DIODE 1SS133, ROHM	1

MISCELLANEOUS

X1	1600-455001-990	CERAMIC RESONATOR KBR455BTLR22 'KYOCE'	1
D2	3101-932200-000	INFRARED LED SLR-932A-20 SANYO	1

INTEGRATED CIRCUITS

U1	4122-220103-800	I.C. PT2222	1

PCB

	4885-700080-002	FL8370/8570 REMOTE CONTROL BOARD REV B	1

FL8370 MECHA ASSY

	6505-050002-001	CABINET HOLDER A	2
	7003-008003-112	SCREW M3X8 B TYPE B/H ZN	2
	7103-012010-022	WASHER M3X12X1MM	1
	7106-212505-022	PLAN WASHER 6.2X12.5X0.5t	2
	8500-055020-302	CABINET TOP ASSY	1
	6005-050001-005	TRUNTABLE	1
	6005-050002-009	CABINET, TOP	1
	6005-050004-003	GEAR BLOCK	1
	6005-050005-001	GEAR BLOCK ARM	1
	6005-050026-000	LEVER LOCK. T.T.	1
	6005-050027-000	BUSH, ROLLER	1
	6005-050028-000	WASHER, BUSH	1
	6600-010212-000	5CD SPRING, GEAR BLOCK	1
	6600-010213-000	5CD SPRING, GEAR BLOCK ARM	1
	6600-010290-001	SPRING LEVER LOCK	1
	6600-020203-000	5CD SHAFT, T.T. ROLLER	5
	6600-020297-000	PIN, ROLLER LOCK	1
	6600-080001-000	YN21R D03/04 PINCH ROLLER	5
	6600-170056-000	RUBBER RING 3.2X5.2X2	1
	7002-608002-062	SCREW M2.6X8 W/H P.T.P	2
	7002-620002-062	SCREW M2.6X20 P TYPE W/H ZN	1
	7003-008002-112	SCREW M3X8 P.T.P. B/H	5
	7003-012002-062	SCREW M3X12 P.T.P. W/H	1
	7103-207004-000	FIBRE WASHER M3.2X7X0.4MM	2

5CD TURN TABLE X1

	8500-055040-301	MOTOR BRACKET ASSY	1
	6005-050019-000	SHAFT BUSHING	2
	6005-050020-000	PULLEY ROTARY	1
	6005-050021-000	GEAR ROTARY	1
	6005-050022-000	GEAR WORM	1

6600-020268-000	SHAFT DIA. 2X34MM	1
7002-003010-111	SCREW M2X3 B/H (BLACK)	2
7103-006005-130	WASHER 3X6X0.5MM CUT	1

MOTOR ASSY

2500-021301-050	2PIN 130MM 1CONN CABLE AWG#28 UL1571 2mmP	1
6005-050018-000	MOTOR PULLEY	1
FF130SH11340-2684A	MOTOR FF-130SH-11340-02684A (MABUCHI)	1
8500-055040-100	MOTOR BRACKET SUB-ASSY	1
6505-050004-004	MOTOR BRACKET	1
6600-020201-001	5CD SHAFT, GEAR ROTARY	1
8500-055050-100	BRACKET ROLLER ASSY	1
6005-050017-000	ROLLER	1
6505-050005-001	BRACKET ROLLER	1
6600-020202-000	5CD PIN, ROLLER	1
6005-050029-001	HOLDER SENSOR	1
6005-050032-000	COVER, HOLDER, SENSOR	1
8500-055210-101	BASE 5CD ASSY REV A	1
6005-050006-001	CAM CABINET	1
6005-050007-000	GEAR, CABINET TOP	1
6005-050008-001	CONTROL CAM	1
6005-050009-000	INTERMEDIATE GEAR	1
6005-050011-000	IDLER GEAR	1
6005-050014-004	LEVER LOCK, OUTER	1
6005-050015-000	LEVER LOCK	1
6005-050034-000	DRIVEN PULLEY 80T	1
6005-050035-000	DRIVEN PULLEY PLATE 80T	1
6005-050050-001	BASE 5CD	1
6090-050002-003	CD90 CHUCKING PULLEY	1
6590-050001-000	CD90 CHUCKING METAL PLATE	1
6600-010210-000	SPRING LEVER LOCK	1
6600-010211-000	5CD SPRING, LEVER LOCK, OUTER	1
6600-090062-000	TIMING BELT, S2M180 90T	1
6600-140001-000	CD90F01 CHUCKING METAL PLATE FELT RING	1
6600-150006-001	CHUCKING MAGNET	1
6600-170021-000	5CD CUSHION RING	2
7002-006001-022	SCREW M2*6 S.T.P. P/H	2
7002-604005-112	SCREW M2.6X4 CLASS 1 B/H ZN	1
7003-008002-062	SCREWM3X8 P TYPE W/H ZN	1
7003-008002-112	SCREW M3X8 P.T.P. B/H	7

LOADER BOARD

7003-008003-112	SCREW M3X8 B TYPE B/H ZN	1
7003-012002-062	SCREW M3X12 P.T.P. W/H	1
7103-012010-022	WASHER M3X12X1MM	1
7103-207004-000	FIBRE WASHER M3.2X7X0.4MM	1
7103-209008-022	WASHER M3.2X9X0.8	3
7103-210012-022	PLAN WASHER 3.2X10X1.2t ZN	2
7103-314010-022	WASHER M3.3X14X1MM ST/ZN	1
7105-010005-030	WASHER LOCK 5X10X0.5MM	3
8500-055010-100	BRACKET GEAR ASSY	1
6505-050008-001	BRACKET, GEAR, SUB	1
6600-020196-002	PIN, CAM CABINET	1
6600-020197-001	PIN CABINET TOP	1
6600-020198-000	5CD PIN, CONTROL CAM	1
8500-055030-301	MOTOR ASSY	1
6005-050023-001	PULLEY MOTOR	1
6005-050024-000	PULLEY DISC	1
9400-501000-171	5CD SWITCH BOARD ASSY REV A	1
2300-003000-001	STRAIGHT CONN WAFER 3PIN 2MMP JST	1
6005-050025-001	SWITCH COVER	1
6505-050007-000	CONTACT PLATE	1
6600-020270-004	BUSH, SWITCH COVER	1
9400-501000-211	5CD LOADER BOARD ASSY REV A	1
2300-003000-001	STRAIGHT CONN WAFER 3PIN 2MMP JST	1
RF500TB14415 D/V9	MOTOR (MABUCHI)	1
8500-055200-101	BRACKET, CD MECHA ASSY REV A	1
3009-110000-000	SANYO MECHANISM DA-11	1
6005-050030-000	BRACKET, CD MECHA	1
6600-020199-001	PIN, LOCK	1
6600-020200-002	PIN, ROUND	1
6600-170069-001	CUSHION 5CD, 30D RED	2
6600-170070-001	CUSHION 5CD, 40D GREEN	2
7002-604005-112	SCREW M2.6X4 CLASS 1 B/H ZN	2
7003-008002-062	SCREWM3X8 P TYPE W/H ZN	4
9483-701000-121	FL8370 LASER PICK UP CABLE	1
4800-310210-001	5ΧΔ ΛΟΑΔΕΡ ΒΟΑΡΔ	1
9400-501000-701	5CD TURN TABLE BOARD ASSY REV A	1
2300-002000-001	STRAIGHT CONN WAFER 2PIN 2MMP JST	1
2300-006000-000	STRAIGHT CONN. WAFER 6 PINS 2mmP	1
2501-062801-150	6PIN 280MM 2CONN RIBBON CABLE AWG#28 2MMP	1

5CD TURN TABLE REV F 4841-010700-006

FL8370 FCC

	1100-102043-000	CERAMIC CAP. 1000PF/50V +-10%	3
	1100-103043-000	CERAMIC CAP. 0.01uF/50V +-10%	1
	1503-161280-100	FERRITE COIL T16128 SIZE: 16X12X8	2
	2605-100502-000	50MM GND WIRE 1RING (M3) AWG#22 BLK	1
	4002-311975-000	TOROID COILS 'T31X19X7.5MM'	4
	6583-710001-000	SHIELD PLATE PHONES	1
FL8370 PACKING ASSY			1
	2611-310009-000	1M AUDIO CABLE (華潤電子廠)	1
	2617-210004-001	3.5MM MIC CABLE 2CONN 1000MM AWG#26 UL2468	1
	5013-835001-001-05	HARMAN/ KARDON FL8370 C/B (W 120V)	1
	5013-835001-001	CARTON BOX FOR FL8350	1
	5026-835002-000	FOAM 50X50X40MM	1
	5100-837000-000	INSTRUCTION MANUAL FOR FL8370 120V	1
	5103-835000-100	LIMITED WARRANTY SHEET HARMAN V/E KARDON BLK	1
	5103-835000-200	WRRANTY SERVICE SHEET HARMAN KARDON 16.5X43CM V/E	1
	5110-837000-000	SERIAL NO BAR CODE LABEL FIR FL8370	1
	5113-000000-000-11	HARMAN/KARDON FL8370 S/N LABEL FOR PROBUET 120V	1
	5113-000000-000	SERIAL NUMBER LABEL, BLANK (6.5X35.5MM)	1
	5113-000000-000-12	HARMAN/KARDON FL8370 MFR. DATE CODE LABEL (120V) PROBUET 120V	1
	5113-000000-000	SERIAL NUMBER LABEL, BLANK (6.5X35.5MM)	1
	5113-835100-100-09	*HARMAN/KARDON FL8370 BARCODE S/N LABEL*	2
	5113-835100-100	SERIAL NUMBER LABEL, BLANK 70X17MM (WHITE)	1
	5113-837000-100-01	HARMAN/KARDON FL8370 (120V) BARCODE S/N LABEL	2
	5113-857000-100-01	HARMAN/KARDON FL8570 (120V) BARCODE S/N LABEL	2
	5199-835000-100	SAFETY PRECAUTIONS SHEET HARMAN KARDON V/E BLK	1
	5200-230321-030-01	POLYBAG FOR ACCESSORIES (FL8350/FL8550)	1
	5200-230321-030	POLYBAG 230X321X3C MM (PE)	1
	5200-600600-040-03	POLYBAG FOR UNIT (FL8350/FL8550)	1
	5200-600600-040	POLYBAG 600X600X4C MM	1
	5206-500160-050	E.P.E. SHEET P-EP500160-05	1
U312	6500-010011-000	HEAT SINK	1
U301/315	6501-010001-000	HEAT SINK	2
	6600-120030-001	NUT M3 HEX M3X5.5X2.4MM	2
	7003-008001-111	SCREW M3X8 S.T.P. B/H BLK	2

	7103-207004-000	FIBRE WASHER M3.2X7X0.4MM	2
	6600-120070-000	SCREW HEX NUT M7X0.75X2.0MM	1
	7107-212004-022	SCREW WASHER M7X12X0.4MM	1

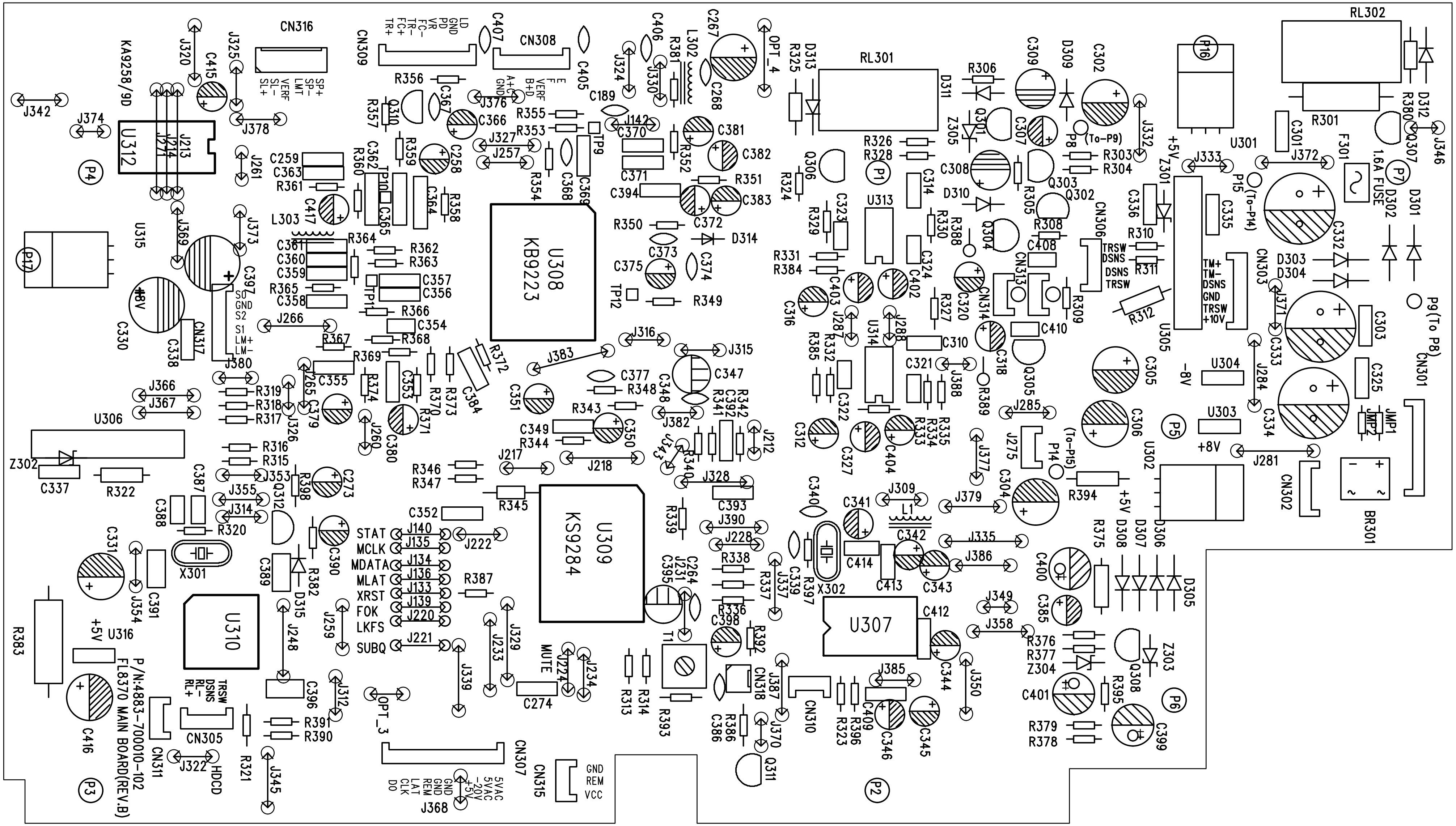
MECHANICAL PARTSLIST

REF. NO.	PRAT NO.	DESCRIPTION	
1	9801-837000-001	FL8370 120V UL (HARMAN) REV A	
2	9683-701000-001	FL8370 MECHAN ASSY REV A	1
3	6029-010012-000-01	PLASTIC FOOT (HOT STAMPING)	4
4	6029-010012-000	PLASTICS FOOT	1
5	6083-510002-000-02	HARMAN/KARDON FL8370&8570 TRAY COVER W/HDCD LOGO	1
6	6083-510002-000	DOOR, CD	1
7	6083-510003-000-02	HARMAN/KARDON FL8350 DISPLAY LENS (W SILKSCREEN)	1
8	6083-510003-000	LENS, DISPLAY	1
9	6083-510004-000-01	KNOB, DISC PAINTED	1
10	6083-510004-000	KNOB, DISC	1
11	6083-510005-000-01	KNOB, PROGRAM PAINTED	1
12	6083-510005-000	KNOB, PROGRAM	1
13	6083-510006-000-01	KNOB VR PAINTED	1
14	6083-510006-000	KNOB, VR	1
15	6083-510007-000-01	KNOB, POWER PAINTED	1
16	6083-510007-000	KNOB, POWER	1
17	6083-510008-000	LENS, POWER KNOB	1
18	6083-510009-000-01	HARMAN/KARDON 'EJECT' KNOB (W SILKSCREEN&PAINTED)	1
19	6083-510009-000	KNOB, OPEN/CLOSE	1
20	6083-510010-000-01	HARMAN/KARDON FUNCTION KNOB (W SILKSCREEN&PAINTED)	1

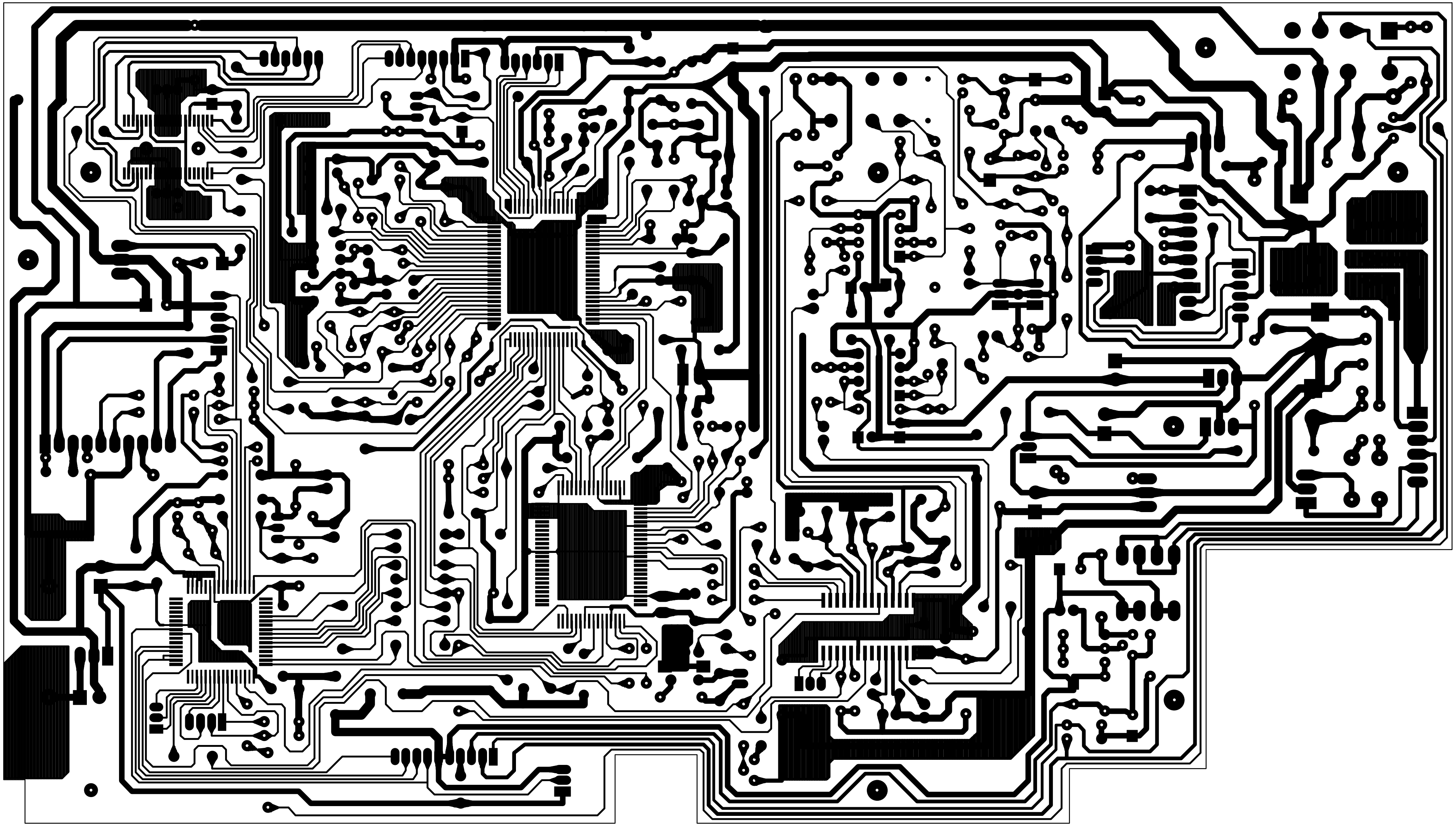
21	6083-510010-000	KNOB, PLAY	1
22	6083-510011-000	STAND, FRONT-5CD	2
23	6083--510012--000	STAND, REAR-5CD	1
24	6083--510013--000	BRACKET, 5CD-SIDE 1	1
25	6083-510014-000	BRACKET, 5CD-SIDE 2	1
26	6083-510015-000	LIGHT SHEET, BLACK	1
27	6083-510016-000	BRACKET, WIRE	1
28	6083-710001-000-01	HARMAN/KARDON FL8370 FRONT PANEL (W/SILKSCREEN)	1
29	6083-710001-000	FL8370 FRONT PANEL	1
30	6083-510001-001	FL8350 FRONT PANEL (PROCESS)	1
31	6505-050003-001	5CD CABINET HOLDER B	2
32	6583-510001-003	BOTTOM CABINET	1
33	6583-510002-000-01	TOP CABINET, PAINTED	1
34	6583-510002-000	TOP CABINET	1
35	6583-510003-002-02	HARMAN/KARDON FL8370 (CE&SEMKO VR) W/230V R/P	1
36	6583-510003-002	FL8370 REAR PANEL	1
37	8583-701010-300	FL8370 FRONT PANEL ASSY	1
38	6583-510004-000	BRACKET, FRONT PANEL	1
39	6583-510006-000	BRACKET, PHONES (MIC)	1
40	6583-510008-000	HARMAN KARDON LOGO BADGE	1
41	6583-510009-000	WASHER SELF-LOCKING EXTERNAL M1.2	2
42	6583-710001-000	SHIELD PLATE PHONES	1
43	6583-510008-000	HARMAN KARDON LOGO BADGE	1
44	6583-510010-000	COVER PLATE	1
45	6600-010293-000	SPRING, POWER SWITCH	1
46	6600-210035-000	PADCOCK 10X10X7MM	1
47	6600-210067-000	PADCOCK, 18X12X3t	2
48	6600-260001-000	LUG CS-1 BLK	2
49	6600-070003-000	CD90R05 RUBBER PAD,LEG	4
50	6600-120030-001	NUT M3 HEX M3X5.5X2.4MM	1
51	6600-120040-000	SCREW NUT M4X7X3	2
52	7003-006001-111	SCREW M3X6 S.T.P. B/H (BLACK)	37
53	7003-006002-112	SCREW M3X6 P.T.P. B/H	3
54	7003-008001-111	SCREW M3X8 S.T.P. B/H BLK	1
55	7003-008002-111	SCREW M3X8 P.T.P. B/H (BLACK)	7
56	7003-008002-112	SCREW M3X8 P.T.P. B/H	18
57	7003-008003-112	SCREW M3X8 B TYPE B/H ZN	2
58	7003-008010-111	SCREW M3X8 B/H BLACK	1
59	7003-016002-112	SCREW M3X16 PTP B/H ZN	2

60	7004-010010-112	SCREW M4X10 B/H	2
61	7103-012010-022	WASHER M3X12X1MM	1
62	7103-209008-022	WASHER M3.2X9X0.8	1
63	7104-010010-022	WASHER M4X10X1MM	3
64	7003-006002-112	SCREW M3X6 P.T.P. B/H	1
65	7003-008002-112	SCREW M3X8 P.T.P. B/H	17
66	7103-209008-022	WASHER M3.2X9X0.8	1

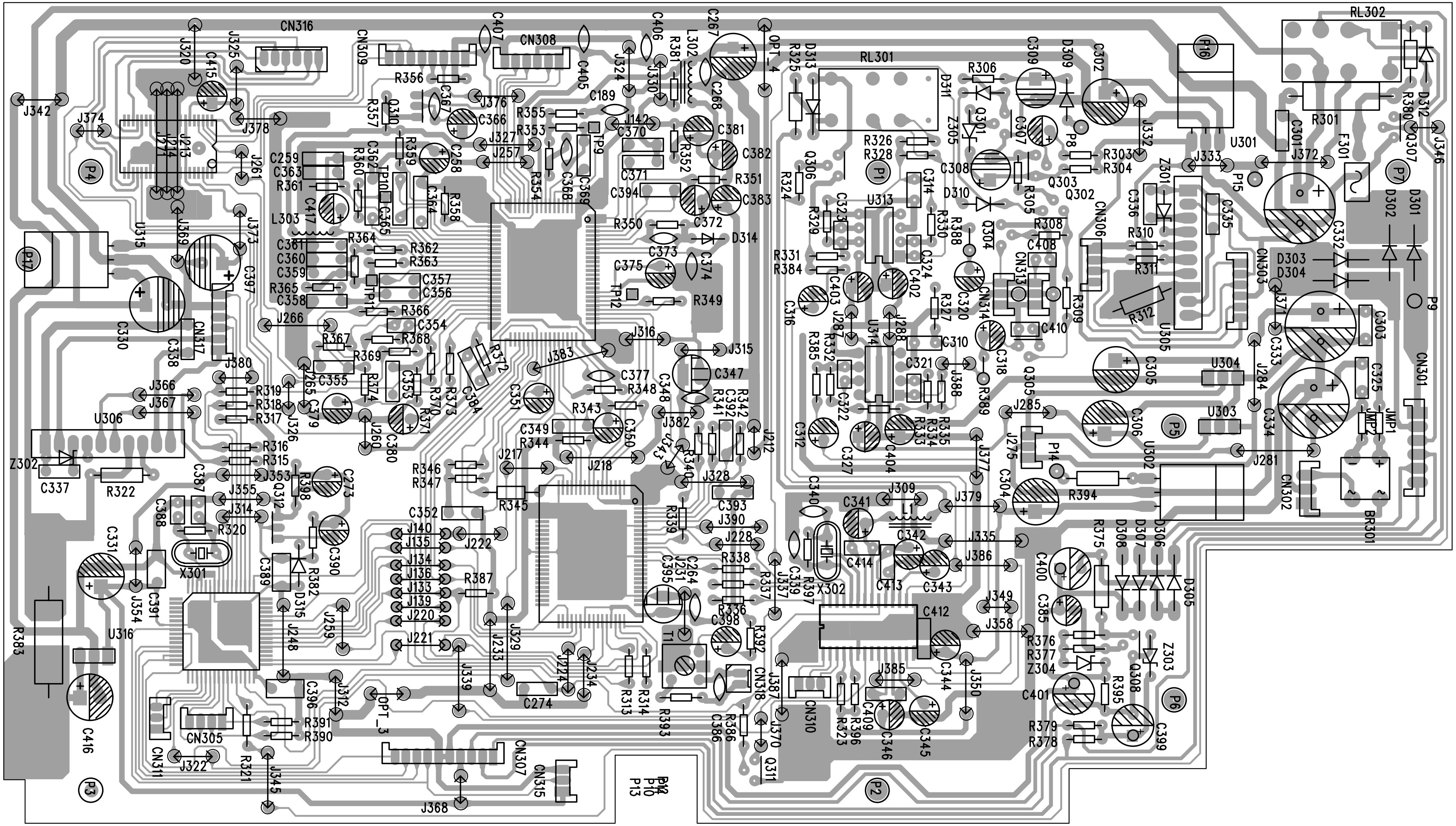
FL8370 MAIN BOARD

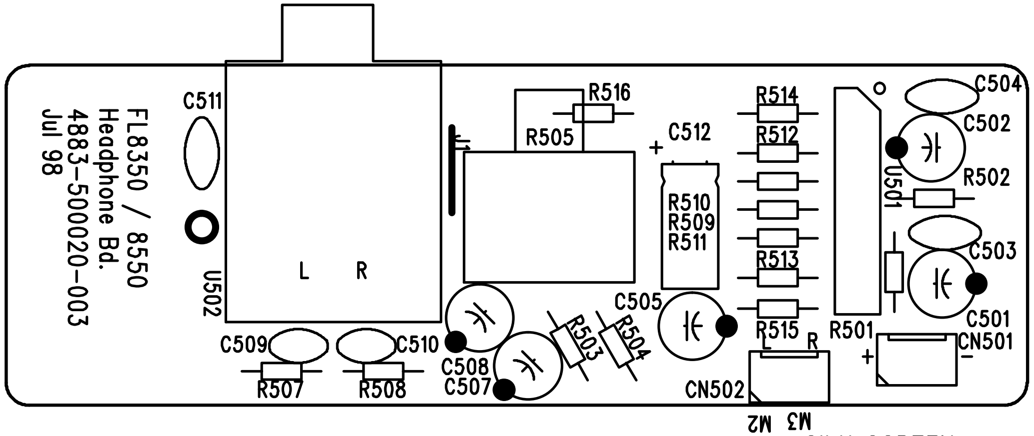


FL8370 MAIN BOARD



FL8370 MAIN BOARD

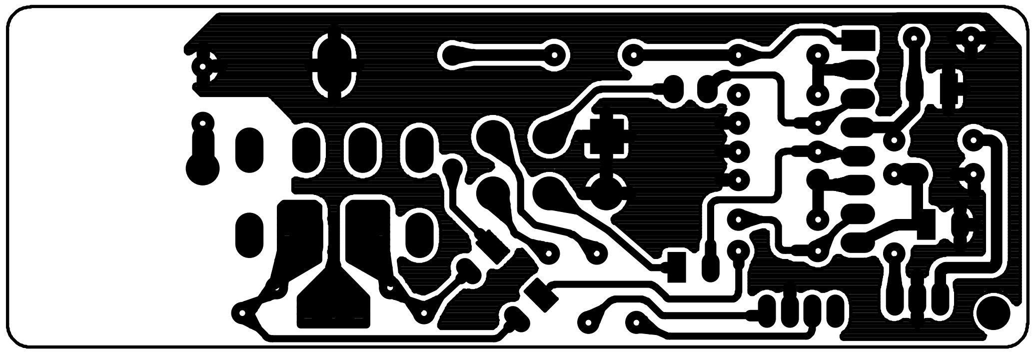




SILK SCREEN

PROJECT : FL8370 HEADPHONE BOARD

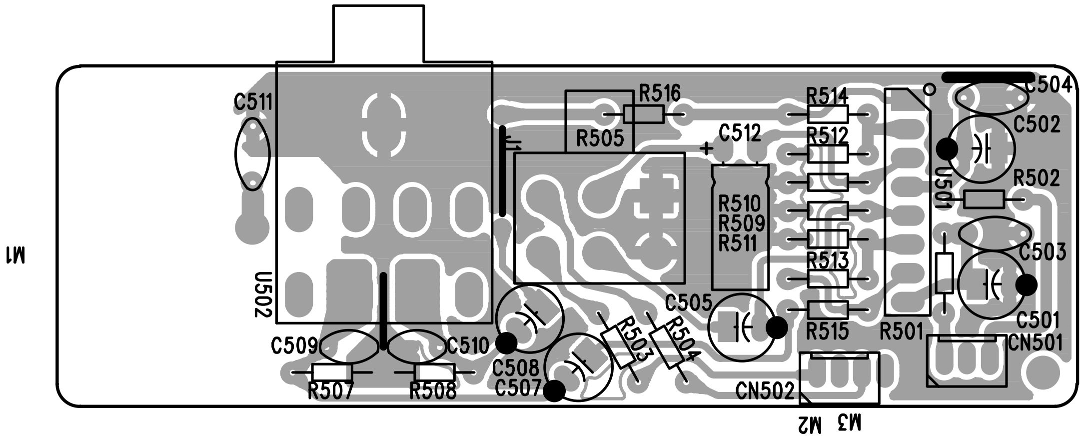
P/N : 4883-500020-003



SOLDER SIDE

PROJECT : FL8370 HEADPHONE BOARD

P/N : 4883-500020-003



SOLDER SIDE

PROJECT : FL8750 HEADPHONE BOARD

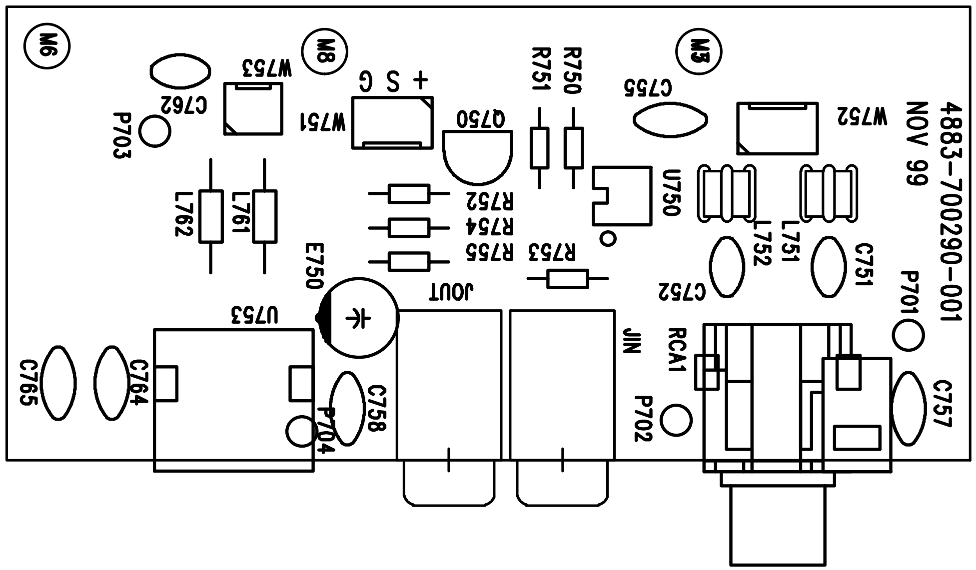
P/N : 4883-500020-003

P/N : 4883-700290-001

Remote Connection Board

Silk Screen

PROJECT : FL8370



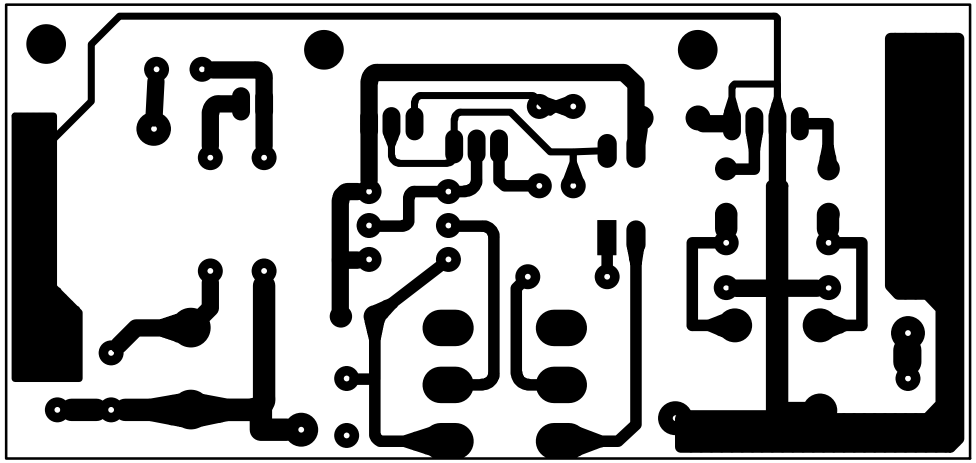
Remote Connection Board

P/N : 4883-700290-001

Remote Connection Board

PROJECT : FL8370

Solder Side



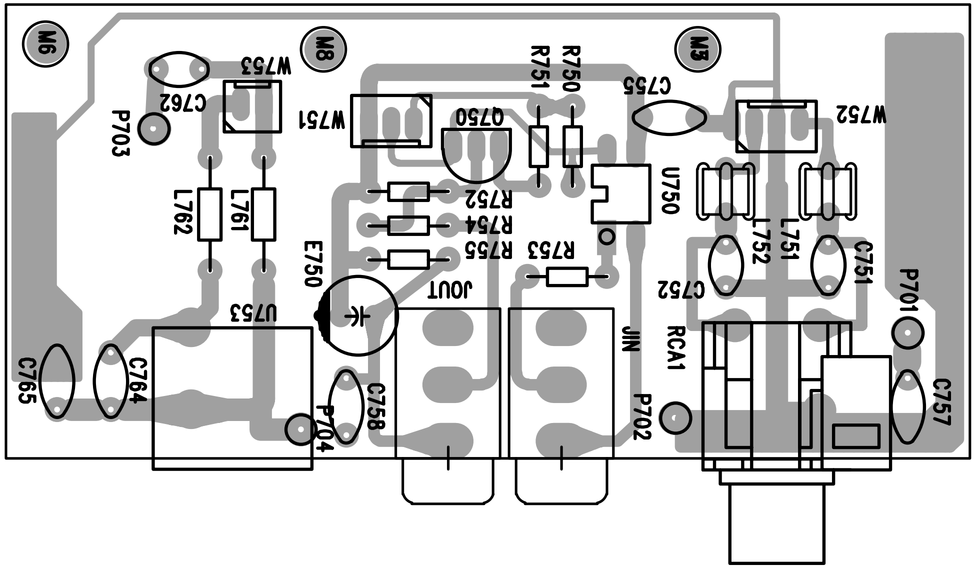
Remote Connection Board

P/N : 4883-700290-001

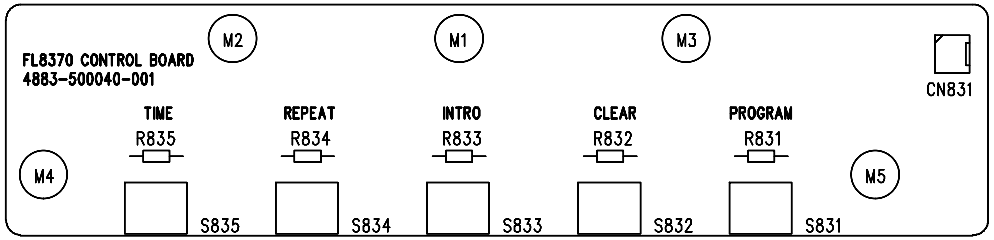
Remote Connection Board

PROJECT : FL8370

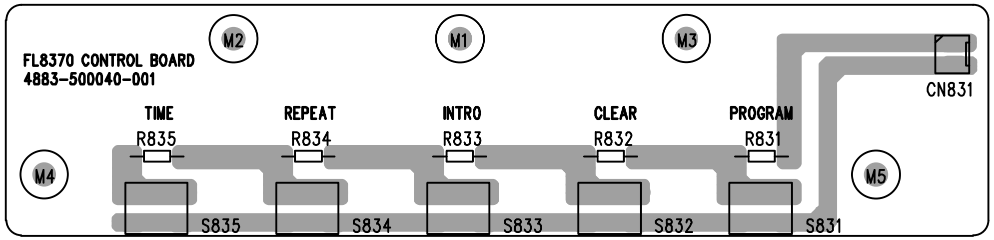
Solder Side



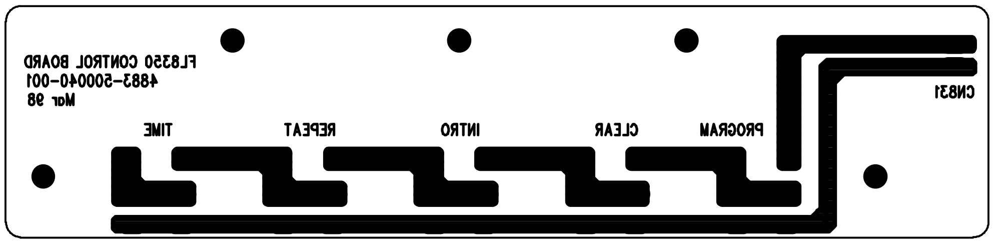
4883-700290-001 gc



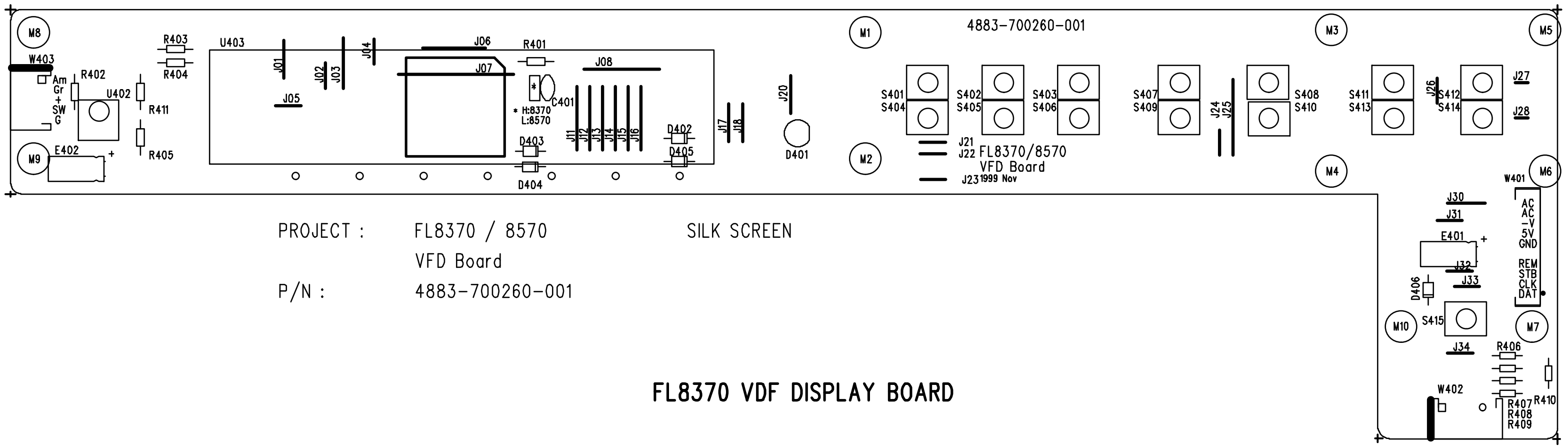
PROJECT : FL8370 SILK SCREEN
CONTROL BOARD
P/N : 4883-500040-001



PROJECT : FL8370 SILK SCREEN
CONTROL BOARD
P/N : 4883-500040-001

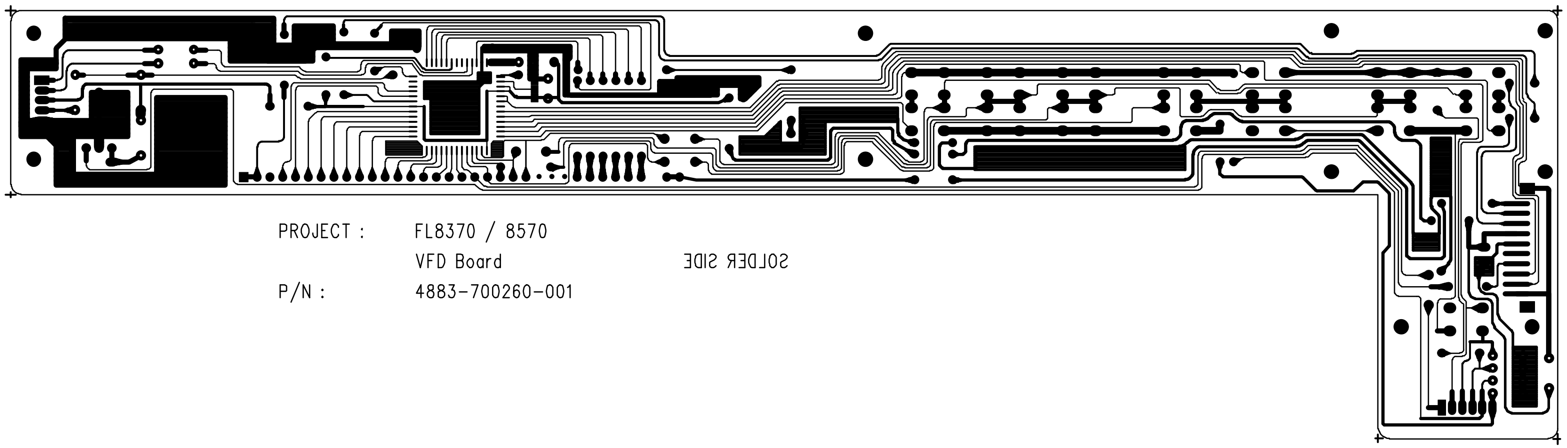


PROJECT : FL8370 SOLDER SIDE
CONTROL BOARD
P/N : 4883-500040-001



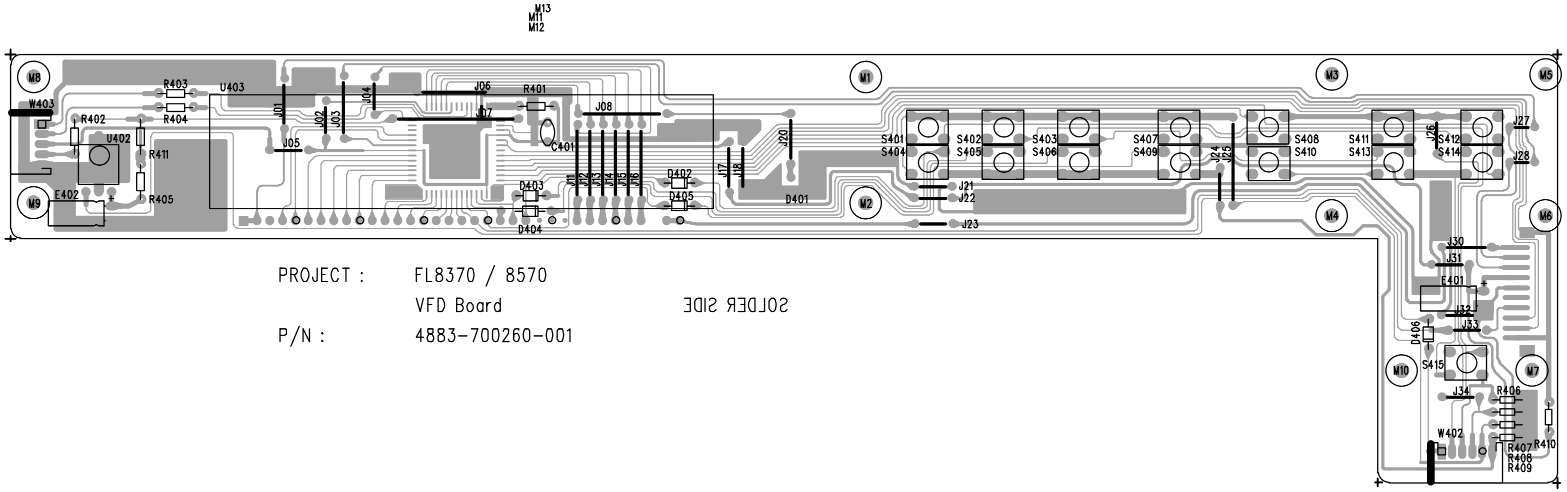
PROJECT : FL8370 / 8570 SILK SCREEN
VFD Board
P/N : 4883-700260-001

FL8370 VDF DISPLAY BOARD



PROJECT : FL8370 / 8570
VFD Board SOLDER SIDE
P/N : 4883-700260-001

FL8370 VFD display board



PROJECT : FL8370 / 8570

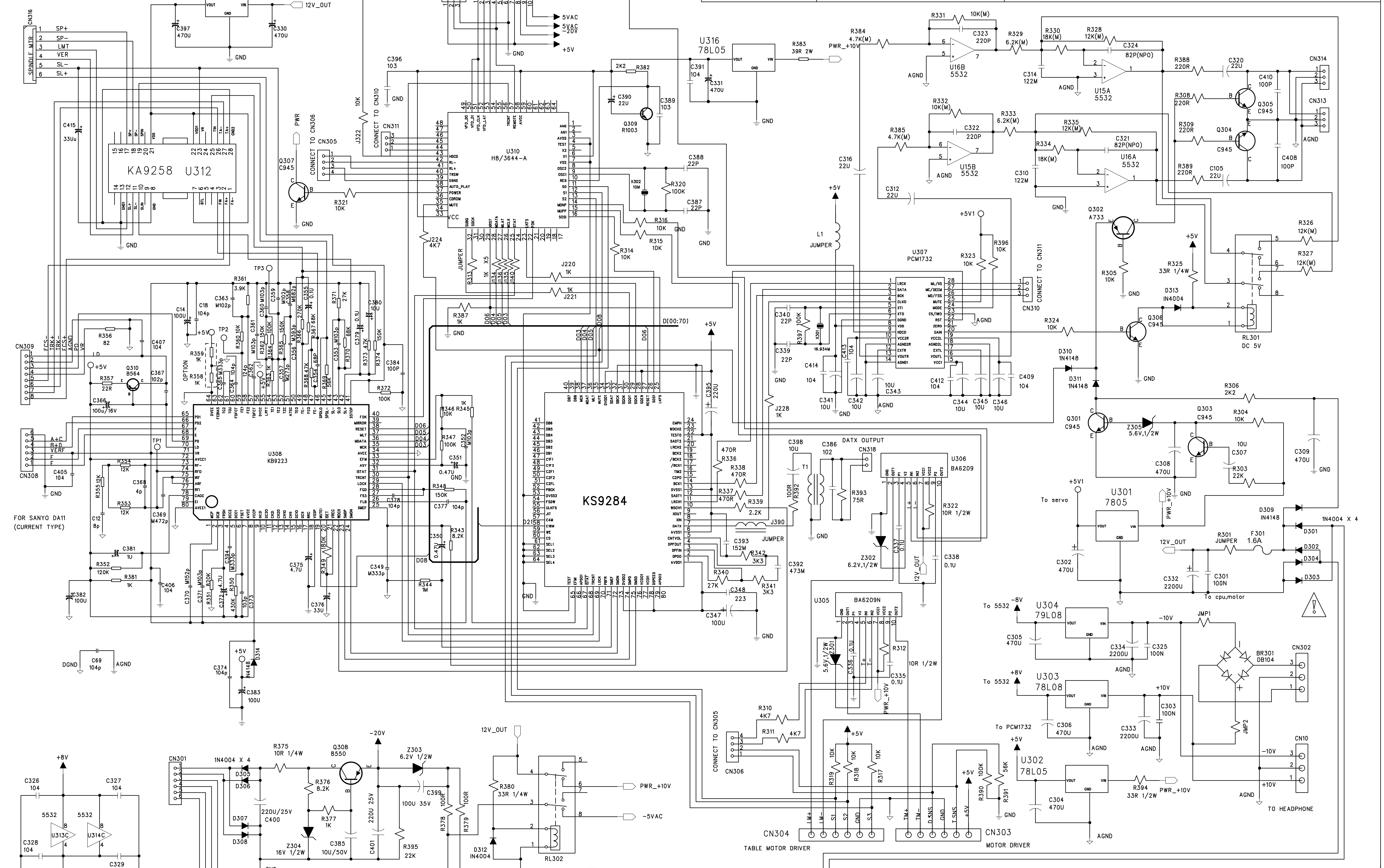
VFD Board

SOLDER SIDE

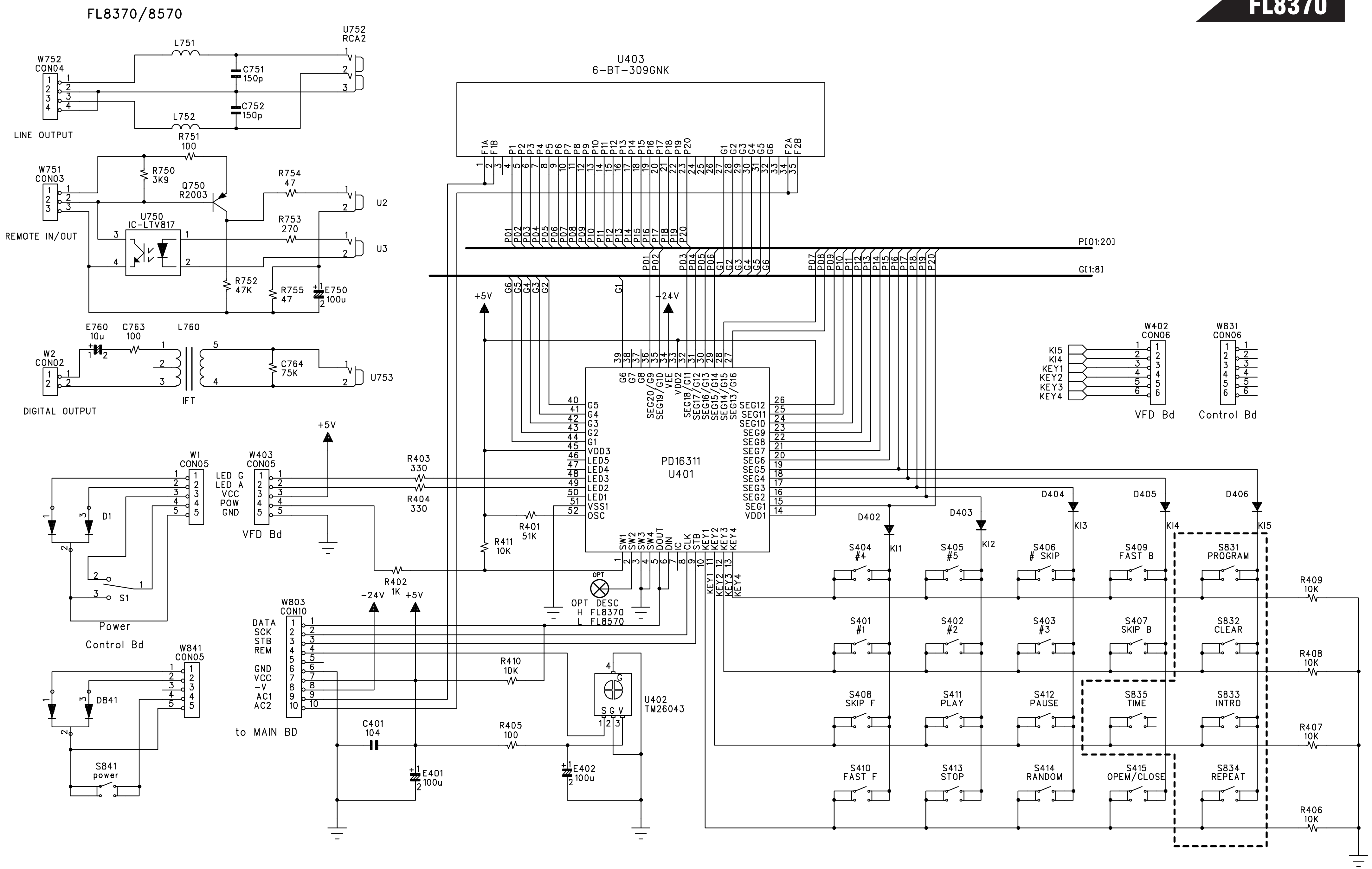
P/N : 4883-700260-001

FL8370

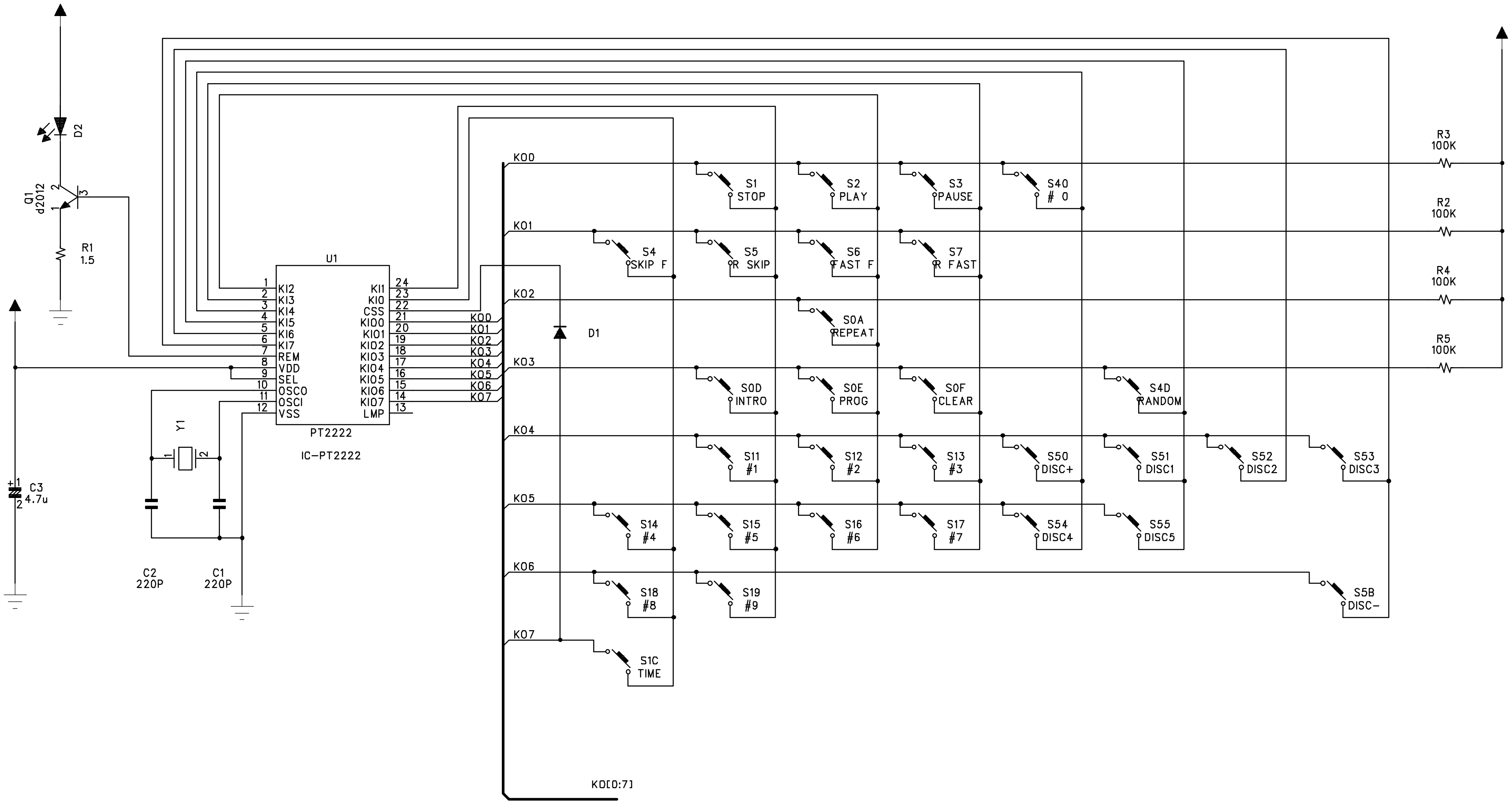
SCHEMATIC DRAWING		FILE NAME	FL8370-MC1
HKENF 970005-00		DATE	1999-11-26
MODEL NO : FL8370	PART NO : 9483-701000-011	PART NAME : FL8370 MAIN BOARD	

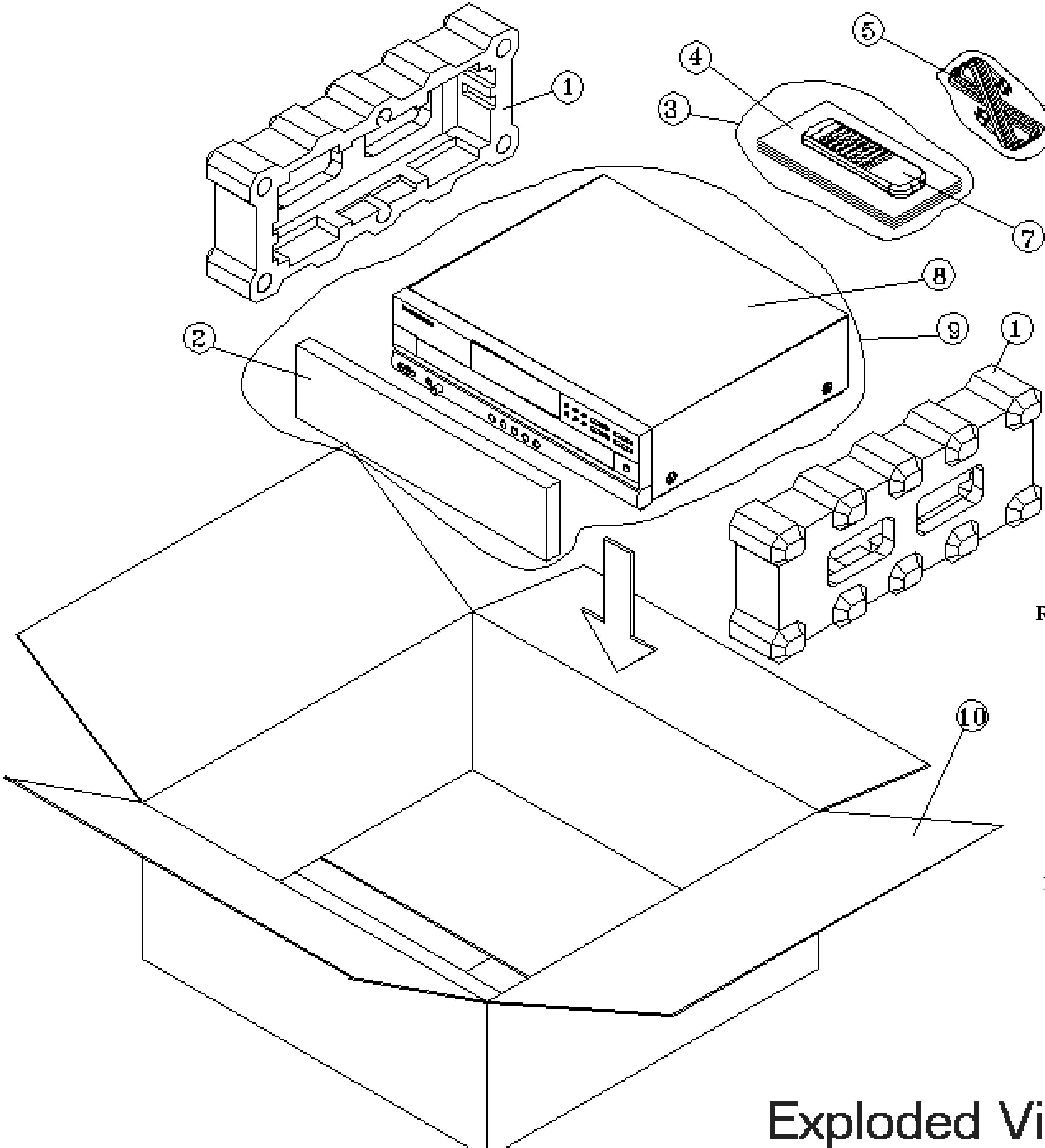


PURPOSE	PRODUCTION	SHEET	OF	REV	A
PREPARED BY :	CHECKED BY :	APPROVED BY :			


FL8370/8570
LINE OUTPUT
REMOTE IN/OUT
DIGITAL OUTPUT
U403
6-BT-309GNK
PD16311
U401
P[01:20]
G[1:8]
+5V
-24V
VFD Bd
Control Bd
Power
to MAIN BD
OPT DESC
H FL8370
L FL8570
U402
TM26043
S404 #4
S405 #5
S406 # SKIP
S409 FAST B
S831 PROGRAM
S401 #1
S402 #2
S403 #3
S407 SKIP B
S832 CLEAR
S408 SKIP F
S411 PLAY
S412 PAUSE
S835 TIME
S833 INTRO
S410 FAST F
S413 STOP
S414 RANDOM
S415 OPEM/CLOSE
S834 REPEAT
S841 power

FL8370 REMOTE CONTROL





Ref#	Part Number	Description
1	5000-835001-001	Polyfoam, FL8370
2	5206-500160-050	E.P.E. Sheet P-EP500160-05
3	5200-230321-030-01	Polybag For Manual
4	1111-FL8370	FL8370 Owner's Manual
5	2611-310009-000	1M Audio Cable
6	5200-100180-030	Polybag For Audio Cord
7	9805-020000-061	FL8370 Remote Control
8	FL8370BLK	FL8370
9	5200-600600-040	Polybag 600X600X4C MM
10	5013-835001-001-05	FL8370 Outer Carton

Exploded View of Unit packaged